# The Builder.

Vol. LVIII. No. 2611. Saturday, February 22, 1890.


## ILLUSTRATIONS.


The Conduit, Great Court, Trinity College, Cambridge.—From a Drawing by Mr. John Fulleylove ..... *Single-Page Ink-Photo.*
Wren's Bridge, St. John's College, Cambridge.—From a Drawing by Mr. John Fulleylove ..... *Single-Page Ink-Photo.*
Wrexham Church and Tower, from the South-west.—Drawn by Mr. Arnold B. Mitchell ..... *Double-Page Photo-Litho.*
Stained-Glass Window, Chiswick Parish Church.—By Messrs. Shrigley & Hunt ..... *Double-Page Ink-Photo.*
Palace of the Cæsars, Rome: Plans of existing Remains, and Restoration by M. Degiane ..... *Double-Page Photo-Litho.*

*Blocks in Text.*

Drawing of one-half of the Mosaic Floor of the Prothyrum of a Pompeian House.—By Mr. A. M. Poynter ..... *Page* 131
Plans of Pliny's Tusculan Villa, as Restored by Castell in 1728 ..... 136
Plan of the Propylæa, Athens, as Restored by Dr. Dörpfeld ..... 138


## CONTENTS.


Masonry Construction ..... 125
Notes ..... 127
Roman Architecture. IV.—By Professor Aitchison, A.R.A. ..... 130
Building Legislation ..... 133
Pliny's Tusculan Villa ..... 135
Illustrations of Cambridge ..... 136
Wrexham Church Tower ..... 136
Window, Chiswick Parish Church ..... 136
Plan of the Palace of the Cæsars ..... 137
On some Typical Greek Buildings ..... 137
Free Lectures to Artisans at Carpenters' Hall ..... 140
The London County Council ..... 141
Architectural Societies ..... 141
Cast-iron Columns ..... 141
Impact Load ..... 142
Air Currents in Sewers ..... 142
The Student's Column: Electricity, Magnetism, and Electricity Supply.—VIII. Magnetic Terms ..... 142
Recent Patents ..... 142
Recent Sales of Property ..... 143
Meetings ..... 143
Miscellanea ..... 143
The Sanitary Assurance Association ..... 143
Prices Current of Materials ..... 144


### *Masonry Construction.**

"The first cost of masonry should be its only cost. Though superstructures decay and drift away, though embankments should crumble and wash out, masonry should stand as one great mass of solid rock, firm and enduring."

THIS may sound very fine; "decay and drift away" rhyme nicely; but, in an absolute sense, nothing is enduring. Endurance is comparative and variable, dependent on climate, physical causes, and so on. Nor do we quite see why the superstructures especially should decay and drift away, as they are frequently structures of masonry. But, whether they be "super" or "sub," we are entirely in accord with the sentiments of the anonymous author of the lines above quoted in that masonry *should* be firm and enduring.

Those lines are the text on which Professor Baker has built up his very interesting "Sermon on Stones." He has given us from Illinois a work of great value, and has been equally happy in the selection of his details, and in the method with which he has placed his knowledge at the disposal of his students, amongst whom we believe he may reckon many on both sides of the Atlantic. The work, 552 pages in length, is divided into four parts:—

Part I. Description and Characteristics of the Materials.
" II. Methods of Preparing and Using the Materials.
" III. Foundations.
" IV. Masonry Structures.
And an Appendix.

These parts are subdivided into chapters, the chapters into articles, the articles into numbered paragraphs, and the numbered into unnumbered paragraphs. It is, consequently, very easy, with the further assistance of a good "Table of Contents" and an index (not, perhaps, quite as copious as might have been), to find our way to any particular point in a particular branch of the subject on which information may be desired.

In the very first article of the book the author at once throws down a challenge which we are not loth to accept. He arranges the merits of good building stone in the following order, and also gives them a space in his book proportioned to the order of merit which seems best to him:—

1. Cheapness.
2. Durability.
3. Strength.
4. Beauty.

It would have been better to have dispensed with any such statement of priority of importance. In the four lines he devotes to beauty, he says that it is "an element of more importance to the architect than to the engineer," and his ideas of what is beautiful appear to be comprised within the expression, "The stone should have a durable and pleasing colour." Beauty of form and of details seem to him almost necessarily excluded from the purview of the civil engineer, and to be confined to the consideration of the architect; but we have always held that these four cardinal merits should receive equal consideration at the hands of civil engineers and their employers. What merit is there in a structure being executed at a low cost if it is neither durable, strong, nor beautiful? It is not cheap at all at such a price. Nor is it cheap if either of these three factors is made to take an inferior position. There are many cases in which durability, or strength, or beauty must independently be of considerably greater importance than mere lowness of cost. There is no word perhaps in the English (or the American?) language so much misinterpreted as the word "cheap."

It is somewhat unfortunate that the author has committed himself to the remark that "it seems questionable whether the Parliament House in London can be made to endure as long as a timber building would stand, so great is the effect of the gases of the atmosphere upon the stone." A good deal of nonsense has been written about this matter of the decay of the stone in the Houses of Parliament. The decay is very superficial, and no difficulty whatever is experienced in restoring or renewing the decayed surfaces. We are all aware now that a better selection might have been made of the stone for that important edifice, but there is no occasion to despair of the endurance of the structure on account of the stone which has been used.

Most of the author's observations relating to the tests of building stones are full of interest, and we heartily endorse the extract in paragraph 19 from the "Report on the Quarry Industry, U.S.A., vol. x.," as follows:—

"Hardly any department of technical science is so much neglected as that which embraces the study of the nature of stone; and all the varied resources of lithology in chemical, microscopical, and physical methods of investigation, wonderfully developed within the last quarter of a century, have never yet been properly applied to the selection and protection of stone used for building purposes."

One of the most difficult tests to carry out satisfactorily is that which is to determine the tensile strength of a briquette of cement. The difficulties lie mainly in two directions: one being to get the briquette properly prepared, the other to get it made the right shape. As regards the first of these points, we have known cases where the contractor's foreman has been quite unable to gauge cement so as fulfil the condition specified regarding the strain per square inch of section which it should bear, whilst the employer's clerk of works has, by superior skill in gauging, made briquettes from the contractor's cement to stand the strain readily, and thereby enabled himself to avoid the unpleasantness of having to reject passably strong cement. This point was very forcibly commented on not long since by Mr. W. Y. Dent,* who speaks of it as "a sleight-of-hand that can only be acquired by practice.' Professor Baker gives us the various modes specified in Germany, England, Austria, France, and America for testing tensile strength. The Germans attach a greater value to the tests with cement mortar than with the neat cement, the mortar being usually mixed in the proportion of one cement to three sand, both the hand-mixed and the machine-mixed mortars being ested. The French particularly specify that sea-water should be used for admixture with the mortar, and that both the air and the water should be maintained at a uniform temperature of from 59 deg. to 64 deg. during the continuance of the experiments, twelve parts (by weight) of water being used to 100 parts of cement and sand combined. With them, as with the Germans, and particularly with the Americans, great stress is laid on the excellence of the sand used for testing, crushed quartz being generally recommended of a size that will pass a sieve of from 300 to 400 meshes to the square inch, and be caught by one of about 800 or 900 meshes to the square inch. It is well, doubtless, that tests

* A Treatise on Masonry Construction, by Ira O. Baker, C.E., Professor of Civil Engineering, University of Illinois. (New York: J. Wiley & Sons; London: Trübner & Co.)

* Lecture on Building Materials. S. M. E. Chatham 1888.

should be carried out with specially prepared sand to show what cement can do; but what we really want to know when we are building is the strength of the mortar we are going to use in a particular structure, and not especially the strength of mortar containing sand which we are *not* going to use. The shape of briquette recommended by the Committee of the American Society of Civil Engineers may be described as very similar to that of the ladies' corsets so much illustrated in some newspapers, and is a slight modification of the briquette adopted by our Board of Works.

In the chapter on mortar, the author enlarges on the subject of mortars in which lime and cement are jointly used, and on the advantage in some cases of mixing slow and quick-setting cements together. He strongly recommends that "lime should be reduced to a paste before being added to the cement." Of course the cost of the mortar is a good deal reduced, but you do not get equal strength. He adds that "the mortar for the 'ordinary brickwork' of the United States public buildings is composed of 'one cement, one lime, and two of sand.'" The relative tensile strengths of mortars of this description, and also of cement mortars, are illustrated with admirable simplicity by means of diagrams with graduated scales, vertically for tensile strength in pounds, and horizontally for periods of time. The same kind of diagram is also advantageously used to show the transverse strength of concretes of various compositions, except that in this case the vertical scale represents the modulus of rupture in pounds per square inch, and the horizontal scale the proportion of cement used. Curved lines at varying heights on the diagram represent the several ages of the concretes tested.

The author exercises his usual care and accuracy in the observations he makes on the effect of the admixtures of sugar and of salt with mortar. He considers that the best qualities of Portland cement derive no great advantage from being combined with sugar; that Rosendale (or magnesian) cement, mixed with from one-eighth to one-fourth per cent. of sugar, gains about 20 per cent. in tensile strength; and that lime mortar gains about 50 per cent. in tensile strength when the weight of sugar added is about 10 per cent. of the weight of the lime. The practice in India is to add 1 lb. of the coarsest sugar to a gallon of water, and he adds—

"It is better to dissolve the sugar in the water than to mix it dry with the lime, since some limes in slaking burn the sugar, which blackens the mortar and destroys its strength."

As regards salt, he considers that, with ordinary and magnesian cement mortars, work can be carried on in frosty weather if salt be added to the water with which it is mixed, the rule usually adopted being as follows:—

"Dissolve 1 lb. of salt in 18 gallons of water when the temperature is at 32 deg., and add 1 oz. of salt for every degree below freezing point."

He considers that the addition of salt to Portland cement mortar does not seem to do either good or harm, and that mortar composed of one part Portland cement to three parts of sand is entirely uninjured by freezing or thawing; this is accounted for by estimating that the expansive force of water in freezing is less than the strength of Portland, but greater than that of Rosendale cement.

We have observed with surprise the very scanty mention the author makes of selenitic cement and selenitic mortar, merely alluding to it in a casual way, as follows:—"The addition of plaster of Paris to common cement is the special feature of selenitic cement,"—a description of that valuable material which is neither sufficient nor sufficiently accurate, and is an omission which is scarcely covered by the observation in the Preface that "it is neither wise nor possible to give in a single volume minute details." It is possible, however, that selenitic mortar is not much used yet in America.

Great stress is laid (and, in our opinion, very rightly) on the character and chemical composition of the material which cements together the particles of which a stone is mainly composed, called respectively "matrix" and "aggregate" when applied to concrete. This is a matter of extreme importance, but it is too often overlooked, especially in varieties of stone apparently hard, such as some of the igneous rocks, many of the limestones, and several of the grits.

Dealing with the pressures on existing masonry structures, the author gives much valuable information respecting the permanent loads on several English and American bridges, and records his final opinion of safe loads as follows:—

| | | | | | |
|---|---|---|---|---|---|
| "Concrete | from | 5 | to 15 | tons per | sq. foot. |
| Rubble | ,, | 10 | ,, 15 | ,, | ,, |
| Squared Stone | ,, | 15 | ,, 20 | ,, | ,, |
| Limestone Ashlar | ,, | 20 | ,, 25 | ,, | ,, ,, |
| Granite Ashlar | ,, | | 30 | ,, | ,, |

But he is especially interesting in the paragraph relating to the importance of the mortar as affecting the strength of masonry, and shows how completely all theories of strength may be upset by the quality and quantity of the mortar:—

"Experiments made upon brick piers 12 in. square and from 2 ft. to 10 ft. high, laid in mortar composed of one volume Portland cement and two sand, show that the strength of the masonry is only about one-sixth the strength of the brick. An increase of 50 per cent. in the strength of the brick produced no appreciable effect on the strength of the masonry; but the substitution of cement mortar (one Portland and two sand) for lime mortar (one lime and three sand), increased the strength of the masonry 70 per cent."

Although it does not materially affect the point of the argument, there is, evidently, a little slip in the passage which has been quoted, for, on referring to the table giving the details of the experiments on brick piers, it is evident that the author should have used the word *decreased* in place of *increased;* and, in place of a gain of 70 per cent., it should have been put as a loss of 60 per cent. in using lime in place of cement in the mortar. Moreover, whilst the brick masonry with cement mortar was one-sixth, with lime mortar it was only *one-tenth* of the compressive strength of the bricks. The description of lime is not stated.

The thickness of mortar in the joints of the best ashlar masonry is especially noticed,—public buildings in cities $\frac{1}{8}$ of an inch, bridge piers, abutments, and large arches from $\frac{3}{8}$ to $\frac{5}{8}$ of an inch, smaller masonry $\frac{3}{4}$ to 1 inch in thickness, and he adds, "the less mortar used, the stronger the wall, therefore the thinner the joints and the larger the blocks, the stronger the masonry, provided the surfaces of the stones do not come in contact." We have in our mind's eye the walls still standing at Samos, in Cephalonia, thousands of years old, though with no roof to shelter them, and other ancient testimonials of skill.

In that part of the work relating to foundations we have a very complete and almost exhaustive treatise. The author truly says,—

"Probably no branch of the engineer's art requires more ability and skill than the construction of foundations. . . . . The decision as to what general method of procedure will probably be best in any particular case is a question that can be decided with reasonable certainty only after long experience in this branch of engineering. . . . . The experienced engineer, even with all the information which he can derive from the works of others, finds occasion for the use of all his knowledge and best common sense."

Certainly; but after this grave warning it is rather startling to the student or the novice to be told that "it is unpardonable that any liability to danger or loss should exist from the imperfect comprehension of a subject of such vital importance."

Who is there amongst us who has had much to do with the design and execution of engineering and building works, that has not had his judgment upset in this respect some time or other in the course of his career? Unfortunately, our misdeeds are too apparent when we have erred. The doctor *may* kill his patient without his blunder being detected, but we cannot kill ours. We may putty up cracks, but they *will* widen and widen, until the inevitable underpinning has to done, at a pretty penny of cost to someone. But we do not expect to remain unpardoned.

The observations on foundations on clayey, sandy, and semi-liquid soils are well worth attention, as also those on "improving the bearing-power of the soil," which the author divides under four heads:—(1) by increasing the depth of the foundation; (2) by draining the site; (3) by compacting (?) the soil; or (4) by adding a layer of sand. The mode of dealing with some troublesome springs in laying the foundation of the dry dock at the Brooklyn Navy Yard is given *in extenso*, but we will not repeat the account of all the rough-and-ready remedies they tried, until at last they hit off one which was successful. A few pages further on we find an interesting collection of portraits of our old enemies, the cracks due to insecure foundations.

The author presents us with the equations and formulæ (aided by diagrams) which he considers most suitable for calculating the extra pressure temporarily brought to bear on certain points of structure, such as the edge of the base of a tall column or chimney, by the force of wind, and his observations on this matter are well worthy of our readers' attention. "If," he says, "the maximum pressure exceeds or is dangerously near the ultimate strength of the soil, the base must be widened."

Over and over again in the course of this book valuable data of work executed are given, and in that part of the work devoted to pile foundations for masonry we have a good example of work with screw piles. "For depths of from 15 to 20 ft., an average of 4 to 8 ft. per day is good work for wholly hand labour."

We have next a close examination of the relative merits of the two principal methods in operation for driving piles,—the steam hammer and the drop hammer,—with an exposition of the disadvantages of the gunpowder driver. After a lucid description of the mode of sinking piles by means of the water-jet, the author compares the respective capabilities of the water-jet and the hammer, and shows that they can often be advantageously used together, especially in stiff clay.

There is a necessary severity displayed in the remarks on the variable results obtained from the different formulæ (which are subdivided by the author into *rational* and *empirical* formulæ) for calculating the supporting power of piles. He says that—

"Many engineers, instead of inquiring into the relative merits of the different formulæ, take an average of all the formulæ they can find, and feel that they have a result based on the combined wisdom of the profession."

The whole of the chapter relating to this point is well worth careful study, and bears the stamp of having been investigated very thoroughly. The author is of opinion that "the deduction of a rational formula for the supporting power of a pile is not, strictly, an appropriate subject for mathematical investigation, as the conditions cannot be expressed with mathematical precision." But he proceeds to argue out the whole matter, laying very special stress on the value of the accurate measurement of the *last blow*, and the necessity for adzing off the head of the test pile, so as to present a sound and solid surface for the last, or test, blow of the hammer.

The equation that he works out to be the most reliable one to be used in practice is—

$$"P = 100.\left(\sqrt{wh + (50d)^2} - 50d\right).$$

P being the pressure in tons, which will just move the pile the very small distance $d$, *i.e.*, the supporting power.

$d$ ,, ,, penetration of the pile, *i.e.*, the distance the pile is moved by the last blow, in feet: to be ascertained by measuring the movement of a point 2 ft. or 3 ft. below the head.

$w$ ,, ,, weight of the ram, in tons."

He admits that, after all, it is only approximate, and is based mainly on the average co-efficients of elasticity of the ram and the pile, but that "probably the error occasioned by the approximations is not material."

Weisbach and Rankine's rational formulæ are given and examined, and, amongst

empirical formulæ, those of Beaufoy, Nylstrom, Mason, Sander, Trautwine, and McAlpine are criticised, and rejected for that evolved by the author. He then, as in most parts of this excellent work, compares theory with practice, and gives a few results of actual measurements taken, and of recorded safe loads, as follows:—

Piles driven 32 ft. into sand sustain 20 tons each.
Piles driven 28 ft. into sand sustain 13½ tons each.
Piles driven 16 ft. into alluvial mud sustain 20 to 25 tons each.
Piles driven 30 to 40 ft. into sand sustain 70 tons each.

The chapter on "Foundations under Water" contains in Article I an admirably clear and instructive section of an ordinary coffer-dam, and a few words in the next page explains the *reason why* puddle is improved by an admixture of gravel, as follows:—

"With pure clay, if a thread of water ever so small finds a passage under or through the puddle, it will steadily wear a larger opening. On the other hand, with gravelly clay, if the water should wash out the clay or fine sand, the larger particles will fall into the space and intercept first the coarser sand and next the particles of loam which are drifting in the current of water; and thus the whole mass puddles itself better than the engineer could do with his own hands. An embankment of gravel is comparatively safe, and becomes tighter every day. While a clay embankment may be tighter at first than a gravelly one, it is always liable to breakage."

Timber is much more freely used for subaqueous foundations for masonry in America than in Europe, and the work consequently contains far more explicit instructions than usual about cribs and crib work, and (as previously noted) about piles, with several important examples of executed work, including that for the Poughkeepsie Bridge (which crosses the Hudson about 75 miles above New York), a few notes of which will be of interest:—

"The crib for the largest of the four piers is 100 ft. long, 60 ft. wide at the bottom and 40 ft. at the top, and 104 ft. high. It was sunk through 53 ft. of water, 20 ft. of mud, 45 ft. of clay and sand, and 17 ft. of sand and gravel. It rests, at 134 ft. below high water, upon a bed of gravel 16 ft. thick, overlying bedrock. The timber work is 100 ft. high, including the floor of the caisson, and extends to 14 ft. below high water (7 ft. below low water) at which point the masonry commences and rises 39 ft. On the top of the masonry a steel tower 100 ft. high is erected. The masonry in plan is 25 by 87 ft., and has nearly vertical faces. The lower chord of the channel span is 130 ft. and the rail is 212 ft. above high water. The crib contains 2½ million ft. of timber (board measure) and 350 tons of wrought iron."

The author particularly emphasises the fact that timber, when *always* wet, is as durable as masonry, "and," he adds, "ordinarily there is not much difference in cost between timber and stone."

Not the least valuable part of this exhaustive work is that devoted to the pneumatic processes for forming foundations, and the conclusions at which the author ultimately arrives are that,—

"Except in very shallow or very deep water, the compressed-air process has almost entirely superseded all others. The following are some of the advantages of this method:—1. It is reliable, since there is no danger of the caissons being stopped before reaching the desired depth by sunken logs, bowlders" [spelt "boulders" usually], "&c., or by excessive friction, as in dredging through tubes or shafts in cribs. 2. It can be used regardless of the kind of soil overlying the rock or ultimate foundation. 3. It is comparatively rapid, since the sinking of the caisson and the building up of the pier go on at the same time. 4. It is comparatively economical, since the weight added in sinking is a part of the foundation, and is permanent, and the removal of the material by blowing out or by pumping is as uniform and rapid at one depth as at another, the cost only being increased somewhat by the greater depth. 5. This method allows ample opportunity to examine the ultimate foundation, to level the bottom and remove any disintegrated rock. 6. Since the rock can be laid bare and be thoroughly washed, the concrete can be commenced upon a perfectly clean surface, and hence there need be no question as to the stability of the foundation."

In "Masonry Dams" we have an extremely interesting and carefully-prepared chapter. The author divides dams into two types,—arch dams and gravity dams; but in consequence of the rare instances in which dams have been constructed arched in plan (there being only two instances known to him), he very properly devotes nearly the whole of his remarks to the other ordinary type. Rankine, Krantz, and Cain's works are frequently referred to. He says that "the profiles of most of the high masonry dams of the world are exceedingly extravagant, and hence it is not worth while to give examples." He gives, however, a maximum section of the great dam proposed for Quaker Bridge, a structure of vast dimensions,—*e.g.*, width of base, 216 ft.; ditto of top, 22 ft. The full height of the masonry structure from the bottom of the foundation to the top of the parapet wall is 277 ft., of which 99 ft. is below the ordinary river bed. The depth of water at the back of this dam is to be 164 ft. The sole of the foundation is secured from sliding by being sunk well below the level of the bed-rock, and is given extra security on this account by means of two longitudinal keys, each 10 ft. square in section, and placed respectively 45 ft. from the toe and heel of the dam.

After discussing the merits of the two types, the author concludes with the opinion that a gravity dam should be built in the form of an arch, *i.e.*, with both crest and toe curved, but that whilst the arch form gives additional safety, "the vertical cross-section should be so proportioned as to resist the water pressure by the weight of the masonry alone." If this is correct, it is manifest that a very slightly-curved dam is the best. He states that the maximum pressure on rubble masonry in cement mortar in some of the great dams of the world is from 11 to 14 tons per square foot. That at the Quaker Bridge dam will be 16·6 tons per square foot. After going through a variety of equations, he gives utterance here, as he does elsewhere in the work, to the contempt which he scarcely desires to conceal for mathematical calculations. He says:—

"There are a number of unknown and unknowable factors, as the weight of the stone, the quality of the mortar, the character of the foundations, the quality of the masonry, the hydrostatic pressure under the mass, the amount of elastic yielding, the force of the waves and of the ice, which have more to do with the ultimate stability of a dam than the mathematically exact profile."

Some remarks on "Rock Fill Dams" are worth perusing; but we drift naturally after "Dams" into "Retaining Walls"; and again, after analysing the theories of Weyrauch, Coulomb, Rankine, &c., he prefers to accept the empirical rules of Mr. Benjamin Baker and General Fanshawe, and gives his reasons for considering the tables of computations for the thickness of retaining-walls to be of but little practical value.

We should like to have seen more space devoted to that branch of the subject relating to the ruin of retaining walls by water at their backs. Looking to some recent misfortunes in the South of England and elsewhere from this cause, it is evident that we want some more light shed on it. So far as they go, the author's observations on this point are most sensible, but there is a quaintness in his suggestion that "one way of making provision to resist the additional pressure which may arise from such saturation is to calculate the requisite thickness of wall as if the earth were a fluid." What sort of fluid does the author refer to? A ton of water has a measurement of about 36 cubic feet, a ton of mould about 33, clay 28, and sand 22 feet. Consequently all dry earths exercise a greater thrust than still water. We apprehend that some other mode of calculation would be necessary in such a case. A few words (less than half a page) are given to "Relieving Arches," but not one word to "Counterforts," notwithstanding the immense importance of a right comprehension of this part of the art of preventing walls from being ruined.

That considerable portion of the work which relates to bridges,—their abutments, piers, and arches,—is a mine of wealth to the student, whether old or young, abounding alike in each part with the theories of experts, with records of actual work and known arches, with tables of contents, and with specifications. We can do no more now than recommend to every one the perusal of these chapters, as also that on culverts; but before concluding we present this extract about arches, which shows so clearly the practical nature of the author's mind:—

"Every theory of the arch requires certain fundamental assumptions, and hence the best theory is only an approximation. . . . . The stability of a masonry arch does not admit of exact mathematical solution, but is to some extent an indeterminate problem. . . . . Considered practically, the designing of a masonry arch is greatly simplified by the many examples furnished by existing structures which afford incontrovertible evidence of their stability by safely fulfilling their intended duties, to say nothing of the history of those structures *which have failed*, and thus supplied negative evidence of great value. . . . . Theory should be interpreted by experience; but the experience should be studied by the light of the best theory available."

Consistently with his opinion respecting the importance of the factor of *cheapness*, the author has supplied in every part of his work records of cost as well as estimates. They are worked out in dollars and cents, and are based on prices for labour and materials to which we are not accustomed in England. Any one who desires could, of course, with a little trouble, compare them and reduce them to the coinage of England or any other country, and no doubt they are valuable in some measure. A somewhat important omission in the work is that of masonry in lighthouses, but of course we could scarcely expect that everything should be included.

In conclusion, let us see whether the author has borne out in his work the claims, or most of the claims, he has made in the preface, viz., that common theories have been compared with the results of actual practice, that principles and methods have been developed, that the subject would be presented clearly and concisely, that it would prove useful to the man of experience, and that no pains have been spared in verifying data and checking results. If each and all of these have been fulfilled, as we consider they have, there can be but one verdict possible.

The author has, however, slightly overstepped the mark when he claims that nearly all the matter is believed to be entirely new. Much is new, undoubtedly; and the Professor must accept our grateful thanks for all that is new; but the work must necessarily, and does, contain a great mass of information which is not new at all. Most of it is worth repeating, but still it is not new, and the claim so far as that,—a really minor point,—is concerned cannot be admitted.

But we close the book with the feeling of satisfaction which always comes over the mind when one has had the privilege of perusing the work of a master hand. Professor Baker's is unquestionably the most complete and the most useful work which has ever yet been published in the English language on masonry construction.

## NOTES.

LORD BALFOUR OF BURLEIGH made an important statement last week as to the course of procedure in the Railway Rates inquiry. The Board of Trade, it appears, are determined to endeavour to bring a Bill (or report, as may be found necessary) before Parliament this session; and, with this end in view, they desire that the number of witnesses be considerably reduced, so that the Court may visit Edinburgh in March, and Dublin in April. Although such a large proportion of the objections have been abandoned, the number of witnesses still tendering themselves for examination is far too large to admit of any hope of this programme being carried out if all are to be heard. It is, therefore, very desirable that Lord Balfour's proposal should, as far as practicable, be adopted. Mr. Balfour Browne may be trusted to keep back no really essential evidence. The views expressed by

Mr. Marshall Stevens as to the effect produced on the companies' profits by high prices for material and labour (to which we alluded last week) were fully borne out by the evidence of a Newcastle witness. Statistics were put in relating to the North-Eastern company, showing that in 1873, when the price of iron and coal touched the highest figure known in modern history, this Company paid their highest dividend, while subsequent dividends have fluctuated very much in sympathy with the variations in the price of these materials. Complaint has been made that the companies do not go far enough in the direction of low rates for quantities. It would, doubtless, be very beneficial for trade if this principle, already recognised, were extended; but at whatever figure the maximum rates are eventually fixed, the exigencies of trade will always exert an influence in this direction, and the companies will find it to their own advantage thus to assist in the extension of business. The desire to limit the companies' power is, of course, due to the fear that these considerations will not restrain them from exacting the "pound of flesh" in the case of traffic passing between non-competitive points, to the destruction, perhaps, of struggling industries. There has been abundant evidence given during the present inquiry to show that this is a real danger.

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THE Council of the Surveyors' Institution has issued a statement of reasons against the application of the "Betterment" principle of rating in regard to the Strand improvements. The ground of opposition of the Institution is mainly based on the principle that most public improvements, and this one in particular, do not operate solely in the appreciation of property, but draw along with them the depreciation of other property; and that therefore a compensation out of public money must often be called for which would balance the increase of rates on account of "appreciation" (a long-established expression which is certainly to be preferred to the clumsy invention, "betterment"). The general principle, as well as the specific application of it in the case of the Strand improvements, is put thus by the Surveyors' Institution:—

"If the appreciation of contiguous property by a public improvement be matter for special taxation, the depreciation of neighbouring property by the same improvement should be matter for compensation. If the public has rights it has also liabilities. The supposed appreciation (or "betterment"), the value of which it is desired to intercept, will proceed from an anticipated increase of trade, and consequently of rentals. But this, in the great majority of cases, would only be obtained to the detriment of some other localities, from which such increased trade and such increase of rents would be diverted. Therefore, in such cases the whole, and in any case the greater part, of any charge or rate which the County Council might succeed in apportioning upon the various parties interested in the properties appreciated should, as a matter of justice, be afterwards distributed by that body among those interested in the depreciated properties: this distribution may be regarded as impossible in practice.

The element of depreciation is obviously present in the Strand scheme. For several hundred yards the southern side of the Strand enjoys at present a virtual monopoly of the traffic,—which means the trade. The widening of the street, and the creation of a rival frontage on the north side, means at the least an equal division of traffic between the two sides of the thoroughfare. It means, indeed, more than this, for upon the new sites will no doubt be erected more attractive premises, comparing favourably with many of the old and cramped houses on the south side. There is no proposal to compensate the south side for a depreciation so manifest and so certain to ensue, but on the contrary to make either owners, lessees, or occupiers pay for the so-called 'betterment.'"

In regard to the general idea that appreciation of one portion of property affected often draws with it depreciation in regard to another, we believe the Council of the Surveyors' Institution are quite correct in their views, and that this side of the subject is one which has escaped notice and demands consideration; but we feel some doubt as to whether their illustration in reference to the effect of the Strand improvements on the property on the south side is quite a valid one. We should be disposed to say that the widening of the Strand and the other alterations which will make this portion of it more central, spacious, and accessible, must inevitably appreciate in a positive degree the property on the south side, though relatively the new site on the north side may enjoy the higher proportion of appreciation.

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WE recently referred to a protest by leading Swedish architects against competition jury decisions of late in Sweden, and the document has now been published. The following is a *résumé*:—The protest first draws attention to one made by two architects in the late competition for the new House of Parliament, which was silently ignored by the authorities, and the undersigned therefore wish to endorse the same as fully justified. Complaint is made that architects observe all the conditions laid down in the programme, but that juries are far from doing so. Four instances are cited since 1886. Thus in a recent competition for a large palace, in Stockholm, it was expressly stipulated in the programme that the style was to be German or Italian Renaissance, and that there was to be no tower, and nevertheless the jury awarded the first prize to the only design sent in, with a tower, and in a style quite different from what the conditions required. In the competition for the new church at Sundsvall it was expressly stipulated that the cost should in no case exceed 250,000 kronor, and still the first prize is awarded to a design calculated to cost 440,000 kronor, and the second prize to one estimated at 475,000 kronor, although there were several estimates within the cost stipulated. In the competition for the new House of Parliament the second prize has been awarded to an architect who has entirely neglected the instructions as to the nature and execution of the designs to be sent in, as well as the position of the building on the site. The complainants ascribe this state of things to the faulty and careless drawing-up of the instructions, and predict that if not remedied the leading Swedish architects will abstain from competing when the awards are so unjust. The protest has attracted much notice in Sweden, on account of the position of the signatories.

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A LONG and important letter on the subject of electric lighting appeared in the *Times* of Monday, from Colonel Flood Page; a letter written partly in pursuance of a request made to the writer, along with Mr. Crompton and the Earl of Crawford, by the Electrical Committee of the London Chamber of Commerce, to give some expression of opinion in the press in regard to the extent of danger of fire from electric lighting. Colonel Page's letter is mainly devoted to arguing that any such danger is more to be apprehended from bad and unscientific installation than from the conditions of electric lighting when properly carried out. Admitting that the percentage of electric lights in use is but a small one at present in comparison with other forms of lamp, it is nevertheless significant to note that during the last three years there has been an annual average of 565 fires in London owing their origin to lamps, gas, or candles, while there have only been in that period four fires attributable to electric lighting, and of these the last one (that in Grosvenor-square) arose from an installation which was pronounced by the most accomplished of experts as being radically bad and not in accordance with any fire insurance rules whatsoever. In conclusion, Colonel Flood Page says:—

"I think that the public may rest assured that while the employment of electric lighting does not altogether get rid of the liability to accidents which is inherent in everything human, and which at present reaches a most serious percentage in the case of all ordinary artificial illuminants, yet it tends to reduce the risk to a *minimum*, far below the chances of fire from candles, oil and gas. The extent of the security is, however, in exact proportion to the skill and care exercised by those who wire the house; while cheap work is in nearly every department of life poor and bad, in wiring for electric light it is simply fatal. I am confident that when a competent electrical firm is employed, and a fair price paid for the wiring, &c., of a house; when a consulting electrical engineer, or a competent fire insurance expert is called in to report upon the work before it is paid for, that those who introduce electric light into their houses may enjoy amongst other advantages a sense of security from fire not to be attained by any other means of lighting their houses. I venture to suggest that every householder whose house has been wired by any one not an electrical engineer should call upon the office in which his house is insured, or if uninsured upon an electrical engineer, to inspect and report upon the electrical apparatus which has been fixed in his house; and to those who are at present thinking of having their houses wired I would suggest that they should intrust the work to some electrical firm of known standing."

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ARRANGEMENTS are progressing for the holding of an international exhibition in Berlin in 1892. The Polytechnical Society has wisely decided not to construct an imitation of the Eiffel Tower, as such an engineering undertaking would now have but little novelty, and as a technical achievement be far eclipsed by the Forth Bridge.

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IN regard to the subject of technical education, it may of interest to note that, according to an official Berlin contemporary, Germany has at present eight technical colleges ranking parallel to the universities. A total of 4,821 persons (or 381 more than last year) are this winter being benefited by the instruction given at these institutions, and of this number 3,372 are matriculated students. Of the eight colleges, Berlin, with 1,457 names, is by far the largest, Munich coming next with 844, and then Karlsruhe 524, Stuttgart 465, Hanover 420, Dresden 380, Darmstadt 275, Brunswick 241, and Aachen 215. Of a total of 757 names entered for "architecture," 435 fell to Berlin, whilst Brunswick has only 13 and Aachen 25 in this division.

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IT would appear certain that the recently-reported case of the Ravensthorpe Local Board *v.* Hinchcliffe renders necessary an amendment of section 156 of the Public Health Act, 1875. That section states that "it shall not be lawful in any urban district, without the written consent of the urban authority, to erect or bring forward any house or building in any street beyond the front main wall of the house or building on either side thereof in the same street." It is unnecessary to state in detail the facts of the above case; it is sufficient to say that Hinchcliffe began to build the front main wall of his house 6 ft. beyond what the Local Board alleged was the front main wall of the adjoining house; this was, in fact, only the beginning of such wall, since it was only five inches above the ground. The court decided that there was no "house or building" within the meaning of the Act, only some beginnings of walls. Therefore there had been no infringement of the Act. But it is clear that if this decision were to be acted on, persons might make what should be a street with a regular level of houses, a street of the most extraordinary kind. It is equally clear, therefore, that this section should be altered by authority of Parliament so as to meet such a difficulty as occurred in this case.

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DR. PARSONS'S report to the Local Government Board (dated January 21) on the prevalence of enteric fever in the Bedlington Urban Sanitary District, suggests a danger to tenants of small rural property which has not been often noticed before, and perhaps does not exist in many places, in regard to the process of emptying privy middens. This is done by contractors under the Local Board; but it is observed that—

"The contractors are only expected to get out the contents of those ashpits alongside of which a cart can be brought. In other places, as where the ashpit is in a yard approached by a narrow entry, it is deemed to be the occupier's duty to get out the contents, and wheel them into the street to be fetched away by the contractor's cart. This practice is objectionable, as imposing an offensive and dangerous duty upon a number of individuals, some

of whom will probably be susceptible to injurious effects, instead of its being undertaken by persons who, being inured to it, are not likely to suffer. Another objection is that the tenant gets out the stuff at such time as may suit him, and it sometimes remains many hours in the street awaiting removal by the contractor."

It is not surprising to learn that the first patient who was attacked by the "fever" attributed the illness to his having a few days before emptied the privy-midden and wheeled the contents into the street for removal. Another evil to which Dr. Parsons drew special attention was the frequently filthy and unhealthy state of unpaved yards and back streets, which were found "littered with refuse through the carelessness of the tenants, and worn into holes full of mud and foul water." A good deal of this may be directly the fault of the tenants, but people of this class eminently need sanitary guidance and instruction.

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THERE is, it seems, in Manchester and Salford, and has been for nearly thirty years, a Society known as "The Manchester and Salford Ladies' Sanitary Association." The Mayoress of Manchester gave an entertainment in aid of it about a week ago, and the Mayor took occasion to describe the work of the Society, which has for its object the improvement of the conditions of life among the people dwelling in the slums. The lady-members are not exactly amateur sanitary inspectors, reporting nuisances and so forth, but rather teachers seeking to instil into the minds of the very poor elementary lessons on health, such as the value of cleanliness, fresh air, the good cooking of plain food, and the evils of their opposites. Leaflets on such subjects as these are distributed, and sixteen mission-women, each of whom lives in the district of which she has charge, inculcate the same lessons; evening classes and amusements form part of the programme, and every summer hundreds of children are sent into the country for three weeks' fresh air. How beneficial such a Society may be to the general health of a district is difficult to estimate, but it is well known that the gross ignorance of the masses of the people respecting simple sanitary and sanatory laws is one great obstacle in the way of general improvement. The apathy with which Boards of Guardians in rural districts, and many Local Boards, regard sanitary reforms, is the result of the same ignorance of the simple laws of health. Dr. Page and Dr. Parsons would not have so many dreadful nuisances to report if there were more such Associations in the country for simply drawing the attention of ignorant people to the first conditions of healthful existence.

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AN excellent and interesting example of road-mending on scientific principles may now be seen on the main road in the neighbourhood of Kensington. At great expense to the ratepayers, the old macadam was taken up and wood pavement was laid down. Like all mundane things, this pavement has begun to show signs of wear and tear, and ruts, not inferior to those which used to find their way into the macadam, have made their appearance. Into these ruts, barrow-loads of stones and rubble are being emptied. The result is certain. The wood becomes disintegrated and broken up, dust in dry weather becomes more abundant than ever, and mud in wet weather covers the wood surface to a much greater extent than hitherto. Such mending hastens the destruction of the wood pavement. But of one thing there can be no doubt, that if wood pavement is to be used where much traffic is found, it must be laid in a manner to exist without ruts longer than it does at present. But if it is laid down, it should be repaired in a proper manner. To set to work as the Kensington Vestry are doing is only to make matters worse.

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THE report of the Special Commissioners appointed by Lord Lothian to inquire into the causes of the Templeton mill disaster has been issued, and is of a somewhat unexpected character as compared with the evidence previously given. We defer the consideration of it in detail.

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"AN Edinburgh Contract of 1754" was the title of an exceedingly interesting paper read by Mr. T. M. Rickman before the members of the Institute of Builders on the 13th inst. The contract referred to was that for the "Exchange," a large block of buildings which covers the site on which it was proposed a year or two ago to erect new Municipal Buildings. Mr. Rickman said that a year ago he purchased a small octavo volume entitled "Contract of Agreement for building an Exchange in the City of Edinburgh, between the Magistrates and Town-Council and the Tradesmen," printed in 1754, which referred to this building. The book contained nine pages of "The Contents," an interesting and elaborate piece of typography; an elevation and a plan of the building; the agreement, including a specification of sixty pages, and an appendix of twenty-seven pages, "containing estimates of the particular pieces of work in the Exchange," comprising the quantities for the whole building. The agreement appeared to Mr. Rickman singular, and one so complicated that it was likely there would be variations in carrying it out, and adjustments necessary in its final settlement. He had endeavoured to investigate what was the outcome of this agreement, but he regretted to say that to a great extent he had been unsuccessful. He had, however, gleaned some information respecting its issue, which he laid before the meeting, as throwing some light on the subject of building contracts, on the system in vogue in Scotland 130 years ago, and, incidentally, on a variety of matters with which it is the business of builders and architects to come in contact in our daily avocations.

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THE London Geological Field Class, which has for its object the systematic study of the geology of the London district, is to be congratulated on having obtained the use of the Lecture Theatre of Gresham College for its winter lectures (mainly through the good offices, we believe, of Mr. T. E. Knightley); and the Gresham Committee are to be congratulated no less on having found a new way in which their building can be utilised. The lecture theatre is not by any means an ideal one for use by day, as the strong light from the windows at the back of the lecturer's table prevents his diagrams and his features from being clearly seen by his audience. But where is the learned society's or philosophical institution's lecture-theatre that even approaches the ideal in convenience and safety? Not to pursue this subject, we will only add that the first of a course of four lectures was delivered to the members of the Field Class on Saturday last by Professor H. G. Seeley, F.R.S., "On the Tertiary Rocks on which London stands." Professor Seeley is master of his subject, and his first lecture was exceedingly interesting.

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THE first number of a monthly magazine, entitled the *Parents' Review*, which is said to be specially written "to aid parents in their great function of training character," contains an article by Mr. E. C. Robins, on "The Profession of Architecture," which is apparently the first of a series of papers under the general heading "Our Sons," and gives, very briefly indeed, an account of the modern architect and his work. Mr. Robins's answer to the question, "What is an architect?" is especially good. "The 'born' architect is a man of poetic temperament, of creative imagination, and of artistic taste and judgment; coupled with seeing eyes and deft hands, he must have scientific accuracy and constructive power; he is at once a designer, a builder, a man of culture, and a man of business. It is more difficult to define what it is unnecessary for him to know than to expound what he may advantageously acquire. He might be an engineer if he were not an architect; but because he is an architect he should be an artist and engineer combined. . . . . We may define an architect as a *scientific artist*." He then points out the difference between an architect and a builder, and states that "five years is the usual term of apprenticeship: but three years is sufficient if preceded by a two years' course at a technical college." Speaking of the new system of Examinations inaugurated by the Institute of Architects, Mr. Robins enumerates: 1st, the *preliminary*, for youths in the opening years of their pupilage; 2nd, the *intermediate*, for pupils nearing the end of their term; 3rd, the final examination, for young architects who have completed their articles, commenced practice, "and are desirous of becoming Associates of the Institute as the only worthy mode of 'registration,' while endeavouring to make their independent way in the profession." A list of the Institute's annual prizes concludes the article. Mr. Robins does not give any opinion as to whether the present state of the profession holds out much hope of success to youths; and that, we take it, is just the one piece of information which "parents" would like to have. His advice is contained in these words: "If there is no love for art for its own sake, in any of its various phases,—no fancy for things beautiful,—do not make your son an architect." "*Hoc fecit Wykeham*," in the same magazine, is a very picturesque article on the great fourteenth-century architect.

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IN a communication addressed to *Notes and Queries*, apropos of St. John's Church, Clerkenwell, Mr. H. W. Fincham seems to determine a question for which diverse criticisms are given by two local historians whom he cites: Pinks and Cromwell. About midway up in the central east window of the present church is fixed a pane of stained glass, bearing a coat-of-arms thus—gules, a chevron or between three combs, on a chief argent, a cross gules. The red cross has been generally taken to denote the old Priory. Having climbed up the scaffolding,—the church's interior being now in course of repair,—Mr. Fincham finds that "upon a narrow band of glass surrounding the coat is inscribed, in beautifully-drawn late Gothic characters: 'Robertus Botyll Pryor: Elect AD 1439 Resign 1469.'" He conjectures that this pane, 15½ in. by 10½ in., may be part of the original filling of the window, or may have been removed into its present position; for the surrounding glass is later in date, from another part of the priory. The removal of the flooring and dado brings to light the bases of some pillars of the earlier church, and, in the southern wall, a pointed doorway, together with portions of ashlar masonry marked with diagonal tool marks in good preservation. It is stated that these remains will henceforth be left exposed to sight. This church was originally consecrated in 1185, by Heraclius, patriarch of Jerusalem; who, in that same year, performed the same function for the Knights Templars' round church, dedicated to St. Mary. It is drawn in one of the three views, by Hollar, of the Hospital of St. John of Jerusalem. In the Guildhall Library is a copy of Vertue's print, showing it as seen from the south, taken from a Cottonian MS. The Order was dissolved by an Act of 32 Henry VIII., c. 24. We adverted to the repairs of the interior of the church in our columns of April 16, 1887.

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AT Messrs. Dowdeswell's gallery in New Bond-street is a large collection of pictures and drawings, by Mr. Yeend King, Mr. J. M. Bromley, and Mr. J. M. Macintosh, in illustration of Berkshire scenery. The bulk of the collection is not of very high interest, but the paintings by Mr. King of some of the street scenes in the small towns and villages have very high merit as paintings of architectural subjects, especially "Thatcham," "Shrivenham," "Abingdon Bridge" (95, 96, and 97), and "Lambourne" (102); also a large painting of the "Water Bridge, Newbury," with its picturesque groups of buildings on either side

of the narrow stream or canal, whichever it is to be called. Both the bridge itself and the whole scene have a remarkable resemblance to the bridge and its adjuncts at Guildford.

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A SMALL collection of the works of Daubigny, now on view at the Goupil Galleries, forms (as is claimed for it in the catalogue) a very good representation of his special powers. Daubigny may be said perhaps to have just missed being a great landscape-painter; he was, at all events, a very gifted artist, with a high ideal, and one who was an eminently poetic interpreter of nature. His range was somewhat limited; but within it he was, in spite of a certain resemblance in feeling to Corot (who was the object of his great admiration) an original artist, with a manner of his own, and a remarkable capacity for painting tender and delicate effects of light, especially moonlight. His moonlight seems at times, as in the pictures numbered 3 and 38 in this catalogue, absolutely luminous in its effect, as if the light in the painting actually radiated from the depicted moon. Some of the river scenes in daylight are also very beautiful, painted in a soft broad style and full of a rich though subdued harmony of colour. The effect of reflected light on calm water was one of the incidents in Nature he evidently especially enjoyed, and represented with great truth; see Nos. 10 and 35. His large sketches and studies of sea (14 and 38) are hardly works to exhibit; even as studies they are not successful or powerful, except in regard to the stormy sky in No. 14. But a collection of more than forty of his works forms an opportunity of studying his art which should not be passed over.

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THE death of Lord Lamington, formerly and perhaps more widely known as Mr. Baillie Cochrane, has been noticed in many papers with marked expressions of respect and esteem for his character and acquirements. There was one especial quality about Lord Lamington, however, of which daily papers would not be likely to take any note, and which it would seem to most of them almost frivolous to mention: he was one of the few men in either House of Parliament who had real interest in and understanding of architecture, more especially in regard to the architectural aspect of public improvements in London. On the rare occasions when anything like culture and common-sense on this subject was to be met with in a debate in the House of Lords, it was from Lord Lamington that it came, in latter days, in at all events the majority of instances. He differed from most public men of his day in considering national architecture a matter really worth serious attention, and painfully and absurdly neglected by the present generation of legislators. His feeling on the matter, as we have heard it expressed in private conversation, was even stronger than was apparent in his occasional speeches on such subjects in the House of Lords; and those who care about public architecture have reason to regret the disappearance of one of the few peers who gave public evidence that he also thought the subject one that was worth attention, and even worth a little enthusiasm.

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**Liverpool Engineering Society.**—The ninth ordinary meeting of this Society for the present session was held on Wednesday evening, February 12, at the Royal Institution, Colquitt-street, Mr. Henry H. West, M. Inst. C.E., President, in the chair. After the usual routine business, including the election of several new members, Mr. Thomas L. Miller opened the adjourned discussion upon Mr. M. C. Bannister's paper "On Mechanical Refrigeration and Ice-Making Machinery." Upon the conclusion of the discussion, a vote of thanks was accorded to Mr. Bannister for his paper.

**Trade Concert.**—On Saturday last the office staff of Messrs. Wm. Brass & Son held their fifth annual smoking-concert at the "Champion," Aldersgate-street, when over 300 spent a very enjoyable evening.

## ROMAN ARCHITECTURE.*

BY PROFESSOR AITCHISON, A.R.A.

### PAINTED DECORATION.

In spite of Vitruvius, I have always held that freehand drawing is outside the proper province of an architect,—his work is confined to what can be done with the rule and compasses; and if you consider that his business is to know how to construct well, to plan conveniently and nobly, to proportion his structure properly, and to compose all the parts of a large building into a shapely whole, not to speak of invention, I think those that understand all that these requirements mean will admit that he has enough to do; at any rate, it is greatly too much for most of us.

If any architect does not agree with this statement of the difficulty of attaining excellence in architecture, let him ask himself whether he is ready to build a dome like that of the Pantheon, of the Cathedral of Florence, or of St. Paul's, not to speak of those larger domes that iron now enables us to construct; if he can equal the best plan of B. Peruzzi, of Palladio, of Longhena, of Wren, of Sir John Vanbrugh, of Soane, of Sir Chas. Barry, or of M. Chas. Garnier; if he uses Gothic, whether he can equal the front of Peterborough, of Notre Dame at Paris, or Giotto's tower at Florence; if he uses Classic, the Scuola di San Marco or the Spinelli Palace, the Cancelleria at Rome, Sta. Maria della Salute, the Pesaro or the Vendramini Palaces, the Bank of England, the front of University College, London, the Taylor and Randolph buildings, or the Reform Club. If he can conscientiously say to himself he can construct like Wren, and plan like Sir John Vanbrugh, and proportion and compose like the Lombardi, Longhena, Cockerell, or Barry, by all means let him acquire sculpture, painting, or both, though, as a mere exercise, the drawing the figure is calculated to improve his eye and his taste.

You may perhaps think it is paradoxical of me to say that construction is of the first importance; but surely, the most essential thing in any building is that it should stand, and next that it should not be defaced by cracks and settlements.

I was once showing the late M. R. Fleury over a building of some architectural pretensions, and he kept saying, "It has a very solid air." I smiled at this doubtful compliment, when he said, "You may smile, but to me the thing of first importance is the solidity of a building. I do not want it to fall on my head, and when I am satisfied on this point I can admire its other good qualities."

Planning is, perhaps, the second great branch of the profession, for it is the foundation of the shape of the building, but as regards the absolute perfection of the plan for the exact needs, it is not so; for he who is a master spirit does not build only, I might even say mainly, for his own time,—he is the poet in stone who builds for remote posterity as well; and it is infinitely more important that this poem should entrance his own and other ages than that the building should be perfectly fitted for its present use. I naturally do not mean that the building should be absolutely unfit for its present use, because it would then be probably pulled down. We can well fancy that when Ictinus and Callicrates had built the Parthenon, that it was by no means perfectly fitted for its peculiar use. The high priest may have complained that they had thought too little of the effect of the statue, or of the other matters connected with the ritual; but what do we care about these defects? All we care about is how it looks now. Yet I would have you endeavour to make your plans as perfect as possible, for if my imaginings be correct, you may be sure that Ictinus and Callicrates were roughly handled by the high priest, and had this fault constantly cast in their teeth as long as they lived.

These remarks merely go to show the paramount importance of making permanent buildings of the most perfect beauty of their kind, as they will give valuable lessons to mankind when their temporary purpose has passed away. After a few centuries, important buildings are mostly diverted to other uses. Diocletian's Baths are now turned into a church, the Pitti Palace into a picture-gallery, the Fondaco dei Turchi into a museum; and churches become picture-galleries, hospitals, museums, markets, or stables. As mere structures they are only useful for the shelter they afford, but as works of art they still cause admiration and delight, afford invaluable lessons to the student, and sometimes even give rise to new styles.

All colour that does not belong to the materials used, and all form that requires freehand drawing or modelling is, in my opinion, painters' or sculptors' work. It is, however, needless to say that a man who is master of two professions is a greater man than the master of one; and, if he is master of three or four, he becomes one of the great men of the world.

The two great sculptors, Leonardo da Vinci (1452–1519) and Michael Angelo (1474–1564) were the masters of many arts and professions. Leonardo describes himself as being a military, naval, and civil engineer, a master of the science of artillery, an architect, sculptor, statuary, modeller, and painter; he was probably a scholar; he was a poet and an author, and was said to be a physician; and we know that he studied music and played so exquisitely on the lute or lyre, that he was sent for by some of the execrable Italian tyrants, to calm their souls when torn by remorse.

I do not profess to criticise painting or sculpture, and I do not, at the moment, recollect any of Leonardo da Vinci's architecture; but in the case of Michael Angelo, we all know some of his architectural works; we overlook the solecisms of the Medici Chapel on account of its sublime general effect.

The great architect, Baldassare Peruzzi (1481–1536), is, I believe, not looked upon by artists as a great painter; and Giacomo Barrozzi da Vignola, the architect who is supposed to have profiled the crowning cornice of the Farnese Palace for Michael Angelo, and whose teaching has been adopted in France as Palladio's has been here, though brought up as a painter, could never get his living by that art.

Only one of the following trainings for architects has, since Greek days, been successfully adopted. The architects have been trained as sculptors, as geometricians, or as practical men, and I do not know which view has the most adherents even now, but I rather think the most prevalent opinion is that architects are like poets, "born and not made," which is doubtless true, only there is so much making required that the theory is unfortunate. In my youth I recollect some one asking in the architectural papers whether his son, who was to be an architect, should study mathematics or classics, but I never saw a reply.

The Greeks are believed to have been sculptors, and the early Renaissance architects of Italy certainly were; the Romans seem to have been practical men; the Saracenic and the Mediæval architects were geometricians. From the sculptor-Architects we get exquisite proportion and perfection of form, an exact knowledge of where floral ornament and figures should come, their proper projections, and their proper finish; the carving has often been done by their own hand.

From the geometricians we get wonderful feats of construction, and almost everything but exquisite proportion, perfection of form, and the exact place and arrangement of floral ornament and figures; and it seems to me that we can rarely get both, for even if we could find a man who had the capacity to master both he must necessarily love one more than the other, and would be greatest on the side he loved best. Nature seems to have given only one of these great gifts to individuals as to nations,—to individuals a genius for the Fine Arts or for abstract studies, and to nations a genius for the Fine Arts or for sway, and hitherto, amongst the nations of the past, these two gifts in their highest perfection have never been combined.

Rise, if you can, from being sculptors or painters to be architects, or from being architects to be sculptors or painters, as your betters have done before you, or be geometricians at once; but do not fancy that you atone for bad architecture because you can daub a little, or because you can draw or model ill-proportioned figures with every limb dislocated.

One of the objects we all have in view is to get the three fine arts employed in all buildings that are to combine utility with delight, and this conjunction is specially important in public buildings, and in buildings of private corporations; mainly, of course, because it adds to their beauty and interest, but partly because it shows that the public and large bodies of

* Being the fourth Royal Academy lecture on Architecture this session. Delivered on Thursday evening, Feb. 6. (For the three previous lectures see the *Builder* for Feb. 1, 8, and 15 respectively.)

men appreciate the advantages of the fine arts. And it is important in other respects, for such owners usually have more wealth at their disposal than private persons, the buildings are mostly on a larger scale, and in more frequented parts of the town. Such adornments, too, attract the dwellers in our colonies, and foreigners, and the adornments themselves are a voucher for the cultivation of the nation. In certain respects this adornment is even more important in private houses, not only because there are more private than public buildings, but because if each dweller be cultivated the whole body of the people must be.

The two great material obstacles to painting and sculpture in private houses are the leasehold system, and the expense. On this latter subject two remarks may be made. First, that, even taking the present costliness of painting and sculpture, something might still be effected by leaving out the bad ornament, too often diffused over the whole front, and replacing it by excellent sculpture concentrated on a few important places; secondly, there must be an inevitable fall in the price of good work when so many thousand students are being educated for nothing, or next to nothing.

It is only adverting to a truism to say that human progress is due to the gradual perfecting of what has gone before, for if this were not the case we might look for new creations in every art and science from savages who have not as yet learned the use of fire. Yet, no one would expect a more perfect steam-engine, a deeper treatise on mathematics, a finer picture, or a nobler building than we now have, from such savages. Even if we were told that such a thing had happened we should not believe it.

At Pompeii we see the remains of a complete system of coloured decoration, possibly the oldest on a large scale that still exists; there are, it is true, small painted chambers that are much older, the tomb of the Lucumo at Veii, and others; and, if we could be sure that the colouring of the Egyptian temples was the original colouring, that might be older still than the tomb of the Lucumo, but we know the colouring at Pompeii cannot be later than the year 79 A.D., when it was destroyed, in the days of Titus. This was the second best period for all the fine arts in the Roman Empire. During the reigns of the Flavian, Ulpian, Ælian, and Antonine families, literature and the visual fine arts flourished, and arrived at a perfection only exceeded at the end of the Republic, usually called the Augustan era.

It is true that Pompeii was only a little watering-place, and we cannot expect to find the arts there in the perfection they had attained in the great cities of the Empire, much less in Rome.

Pompeii only gives us a glimpse of the system. This would be valuable enough under any circumstances, but it is invaluable now when we can get nothing, or next to nothing, else.

The Romans were evidently great admirers of colour. In their public and magnificent private buildings colour was mainly got by veneering or fineering* the walls with beautifully coloured marbles, to obtain which every part of the known world was ransacked; one of the marbles, a sort of dirty yellow, called Astracan, is said to have come from Agra in India; we know, too, that the mere apposition of beautifully-coloured and contrasting marbles was not enough to satisfy the eyes of the Roman, and to attest their magnificence, for the marble was often inlaid. Statius describes the purple synnadic as inlaid with Giallo Antico, and Seneca speaks of porphyry or Egyptian serpentine ornamented with the same marble. Very few quarries of beautifully-coloured and figured marbles have beds large enough for the great monolithic columns the Romans used, so the shafts had to be of Pentelic, Parian, Carrara, grey Greek marble, of Giallo Antico, or Pavonazzetto, or else the shafts were of red or grey granite or of porphyry. I do not know if monolithic columns of the black Lucullean marble were to be got of the largest size. Pliny merely says there were 360 columns, 38 ft. long, at the temporary Theatre of Scaurus ("Nat. Hist.," XXXVI., cap. 24), which were afterwards removed to his house. The capitals and bases of columns, where Parian marble was not thought good enough, were of gilded bronze, and often the girders and roof-tiles were of the same metal. The doors of the temples at least were adorned with gifts and garlands and with stuffs embroidered with gold,

* The proper word is fineering, from a German word meaning to inlay, borrowed by the French, and again from the French by the Germans. *Fineering* is used in Sir William Gell's "Pompeiana" and in Burns.

*Drawing of one half of the Mosaic Floor of the Prothyrum of a Pompeian House. By Mr. A. M. Poynter.*

as we read of in the story of Psyche by Apuleius (Apuleius, Lib. VI.), and probably the columns and walls of the front of temples had embroidered hangings and festoons.

Originally the ceilings, vaults, and upper parts of walls were adorned with embossed plaster, painted and gilt, but, after the introduction of glass mosaic, the remaining part of the walls and the vaults were mostly covered with ornament or figures executed in it (Pliny "Nat. Hist.," Lib. XXXVI., cap. 14). We cannot now tell if the glass story of Scaurus's theatre was covered with slabs of cast glass, and the column shafts made of cylinders of it, or whether the whole was merely in mosaic (Pliny "Nat. Hist.," Lib. XXXVI., cap. 24). Columns covered with glass mosaic in patterns have been found at Pompeii, but it is thought by many antiquarians that this glass story was of cast glass. If to these magnificent decorations you add the floors of precious stones, the doors of carved ivory, of embossed and damascened bronze, or of beautiful woods inlaid, you have a splendidly coloured effect, and all the adjuncts were equally splendid. Arms and armour were embossed with sculpture and damascened with gold and silver, and often enriched with gems; the dresses were crimson, scarlet, purple, blue, green, yellow, grey, and white, and mostly embroidered; the couch covers were embroidered in gold and colours; there were gold and silver tissues, splendidly-coloured curtains and carpets, not to mention furs; garlands and festoons of flowers, and shrubs and plants in pots; so I think you must admit that most buildings exhibited a most gorgeous display of colour, not to speak of the troops of slaves of all colours that enlivened the scene; and that this taste for colour was not a mere accident dependent on the use of costly materials, but was desired by the people, may be judged of from this, that whenever the walls were plastered the Romans painted them both inside and out.

Rome towards the end of the Republic was the one city from which the mandates of the Senate issued to the world, and must, therefore, have been thronged with the ambassadors of nations and their suites, with deputations from numberless cities, as well as with crowds of foreigners who had merely come to see what Rome and the Romans were like. It had too suddenly become possessed of the hoarded treasures of the world, and of an immense annual revenue from the tributes of the conquered. In consequence, it had become the emporium of the earth, to which all the talent, as well as all the choice commodities, of the world gravitated. The people were no longer the rude husbandmen who could only fight, speak, and make laws, but the better class at least had become cultured, so far as culture is consistent with trained ferocity and the absence of humanity. They read and spoke and wrote Greek, and were much employed in translating and imitating the masterpieces of Greek literature, and in learning Greek science, and eventually they were trying to rival both. Many of them learned to draw and to model, some even learned to play on an instrument, and nearly all professed to be connoisseurs in painting and sculpture, architecture, and articles of virtù. Their public buildings were crowded with the masterpieces of the Greek chisel,—in Scaurus's temporary theatre there were three thousand bronze statues,—and the best easel pictures of the Greeks were in their temples, not to speak of those in private houses. As far as wealth could purchase talent they had the best, for the Romans had no notion of being outdone, even in the visual fine arts, by the nations they had conquered, and they also wished to see the great achievements of their arms recorded.

It is, perhaps, hardly necessary to mention that mere wealth can but buy what is to be had; it has but little stimulating effect on the transcendental faculties, and does not produce a medium or a surrounding in which genius naturally springs up; it is only when the arts are passionately admired that they arrive at perfection. I fancy all nations and all epochs get what they really and ardently desire. The Greeks adored beauty in every form, and they got it; the Romans adored valour and strategy, eloquence and statesmanship, law and order, and they got them; but the slaves who merely administered to their ostentation, or beguiled their idle moments, they thought were only worthy of a pat on the head or a handsome present. Amongst these slaves were the painters, sculptors, architects, musicians and singers. Old Pliny had wit enough to see that when the artist's highest object was wealth the art he practised necessarily declined; but he did not see that this desire for wealth amongst the artists was only the effect of their surroundings: high poetry only comes from a noble society when every fibre has been strung by passionate emotion. In the present day we have plenty of great natural philosophers, because the people love natural science, and a vast proportion of them know something about it, and passionately admire the great masters of it. These masters may be otherwise obscure, and only just above poverty; but they know the very mention of their names, through the wide realms where English is spoken, will evoke feelings of pride and a thrill of emotion. The feeling for architects in the present day, and the admiration for their works, reminds me of Milton's,—

—— "Sent
With his industrious crew to build in Hell."

In the middle period of the Roman Republic there seemed likely to be a chance of painting being considered as a generous art, for some distinguished men in Rome practised it.

As early as 303 B.C., C. Fabius Pictor painted the Temple of Salus, on the Quirinal, and these paintings remained until the Temple was burnt in the reign of Claudius (41–54 A.D.), and his pictures were admired by the critics of the Augustan age. Pliny also tells us that Pacuvius, the poet (220 to 130 B.C.), painted the Temple of Hercules, in the Cattle Market

(Forum Boarium). About the same time P. C. Æmilius Scipio Africanus, the son of Æmilius Paulus, studied painting and sculpture, though painting subsequently seemed not to have been recognised as a generous art, and we hear no more of men of noble family practising it publicly. We have every reason, however, to believe that subject-pictures were as common in houses during the Empire as they were in the Middle Ages.

In Trimalchio's villa we read of painted subjects, past the porter's lodge, probably painted on the walls of the Prothyrum; others on the walls of the portico, probably the atrium, for it is the atriensis who explains them; and not far from them is the dining-room.

Many of the pictures at Pompeii are supposed to be indifferent copies of well-known subjects by the greatest Greek artists, and it is interesting, even if it be not useful, to architects to see how wall pictures were made into an integral part of the decoration; triptychs and framed pictures were hung on the walls just as they are now.

Three favourite schemes seem to have been adopted for the general decoration: the first, and ugliest, was to paint some doors, fill up the parts between with paintings of slabs of marble of different colours to paint a string, and some panels of plain colour above the marble, or to paint a row of full-sized columns or pilasters and fill in between with bordered panels of plain colour, or of imitation marble, and sometimes to paint festoons hanging from column to column. The second scheme was to divide the space, if comparatively narrow, into three vertical divisions with a wide centre and narrow sides, or, if wide, into alternate divisions of narrow and wide spaces, to make a dado line and panel it and the wall above, and to put some slight ornament in the panels or on their borders, and this was usually in monochrome. Still, there are rooms that are treated in a similar way and coloured; the narrow divisions are sometimes not panelled, but have a candelabrum in them, while the larger spaces are panelled, and have birds or figures in the middle, a few rooms are found that are merely panelled, and are without any other ornament than the lines forming the panels, the dado, the frieze, and the cornice.

The third and most usual plan was to divide the height into three unequal parts horizontally, to make the bottom part a dado, to make the middle piece the wall, and above that to make the painting represent the open air, or a wall with open windows in it. Very slight columns that divide the length of the room were put on the dado, or podium. It was customary to put large and important pictures on the back of a shrine, the front painted columns, supporting the roof of it, standing forward; to put some other slight columns, candelabra, or slight narrow structures at intervals, and to panel between them, the centre of the panel being often enriched by a floating figure or a bird. Occasionally, a small framed picture is put in some of the panels, to look as if it were hanging on the wall.

A favourite device, instead of panelling, is to put a light column where the divisions of the panels would be, and let it run up above the part representing the wall, and support one end of an entablature, which is supported at the other end by a column outside the wall.

In the house of Spurius Masor the dado is black with lilac lines, one above the skirting and one half-way up the dado, crossed by vertical lines under the centre of the columns; at the crossing there is a square, with a naturally coloured mask in the middle, and a lozenge with a patera on the middle line between the two squares. The skirting is an imitation of black marble streaked with grey, put with the streaks slanting, and in each alternate piece the opposite way. The wall above the dado has a frieze above and a wide band below; in the middle is a picture of a huntsman and a dead fawn and a priestess; this picture is on the back wall of the shrine, the front is supported by two slight white columns with coloured bands, and at four places garlands are wound round the columns and carried up diagonally to the next band. The shallow entablature of the shrine is panelled with square panels, whose borders are green and pale plum colour, with the centres and two end panels bordered with white; the centres of the panels are dull orange and plum colour alternately, with patterns in white and green. The soffit of the top is a yellowish brown and coffered, meant for wood. All round the picture is a framework of black with white and lilac lines, and the band above the dado before-mentioned is a dull orange at the sides and purple under the picture, separated at the top by one broad stripe of green next the black, and white below. In the band under the picture are birds and fruit; under the sides are vases and a volume. The side panels are a deep, dull red, with a small Cupid in natural colours in the middle; a border of about one-ninth of the whole width is formed by five lines, and on the centre line are squares and circles alternately, filled with green, with white ornaments on them. The frieze above is black, with a goose, a basket of fruit, a sistrum, and a bottle in natural colours, and this is separated from the red by an orange and green band; above the black frieze is a bluish cornice with red and orange lines; above this the wall is a creamy white, with light buildings, birds, and sprigs of foliage in light colours.

It is of no use talking about form or colour, for these cannot be described in words, but must be shown with the pencil or the brush; but I may say that the invention displayed is marvellous—plants and flowers, garlands and panels, beasts, birds, and chimeras, scroll-work and figures, are used in profusion, but are mostly confined to borders, the panels being mostly of one uniform plain colour. Though it is hardly necessary to say much of Pompeian decoration, as it is so well known, I may mention that the painted rooms found on the Palatine are in the same style, and from similar chambers found elsewhere most subsequent classic decoration has been taken.

The paintings on the walls of the Loggia at the Vatican are believed to have been taken by Raphael and his pupils from some underground Roman chambers that were excavated and filled in again, or if they were not copied, they were paraphrased. In Roman days this style was universal: we find the same sort of thing chased in silver, in the treasure of Hildesheim. This decoration is supposed to have been invented by the Greeks of Asia Minor—Vitruvius speaks of some executed at Tralles by Apaturius of Alabanda (Vit. Lib. VII, c. 5., p. 5),—and the idea of it may have been suggested by the tents and marquees formed of embroidered stuffs. "Attalicæ Vestes" were celebrated; *i.e.*, stuffs embroidered with gold at Pergamium, as well as Babylonian and Alexandrian work, which were in colours.

At Trimalchio's feast, during the interval between the courses, fresh covers are spread on the couches, "on which were embroidered the nets, the ambush men with their hunting spears, and the whole apparatus of a hunt" (Pet. Sat., cap. 40). We do not know whether this was a piece of Roman work or not, but these hunting scenes have been common subjects of Indian embroidery from the earliest historic times, and are known as wild-beast patterns.

The use of this sort of arabesque that is met with at Pompeii called down the indignation of Vitruvius; he says (Lib. VII., cap. 5, p. 3), after speaking of paintings representing persons, animals, places, or things:—"Those examples, however, which the ancients adopted from real objects, are now disapproved of in consequence of our depraved taste. For monstrosities are painted on the plastering instead of well-marked copies of definite objects; thus reeds are put in the place of columns; in the place of pediments, little striped grapnels with crisped leaves and delicate volutes, and also candelabra, supporting the representations of little temples, above the roofs of which are delicate scrolled stalks rising out of roots, and most of them having little images seated upon them, against all reason; and quite as irrationally also, flowers springing out of these stalks, and having little images half issuing out of them, some with men's, others with beasts' heads. But these things neither are, nor can be, produced, nor ever have been. Thus our new taste has brought us to this point,—that through the inefficiency of bad criticism the excellencies of the arts have shut their eyes for the time. How is it possible for a reed to carry a roof, or a candelabrum a little temple and the ornaments of a pediment, or so tender and soft a stalk to carry a seated image, or to produce flowers and half-figures partly sticking out of roots and stalks? Nevertheless, men, on seeing these falsities, do not condemn them, but are delighted, and never think whether any of them could or could not exist. Minds, however, that are obscured by infirmity of judgment have not the power of testing what is possible, consistently with the authority and reason of grace; for neither ought pictures to be approved of, which have no resemblance to reality; nor even if they are rendered elegant by their art, ought the judgment about them to be on that account favourable, unless they rest on sound reasons of argument, set forth without self-contradiction."

My translation of this crabbed passage may not be correct, but I got it revised by Professor Middleton and Mr. Holmes, of Pembroke College and St. George's Hospital. What sort of decoration these "harpaginetuli striati cum crispis foliis et volutis teneris," translated as "little striped grapnels, with crisped leaves and delicate volutes," may be meant for, I cannot say. The editors of the "Pitture Antiche d' Ercolano" (1757) believe them to be shown in a wall decoration. There is a small open circular Ionic temple, and above the cornice of it are uprights projecting at an angle, with staff between, in the upper fringe of which there are two volutes and an upright stem that might possibly be taken for grapnels; we do not, however, see either the striping or the crisped leaves.

We being accustomed to the immense strength of iron and steel, are not so much shocked with the apparent weakness of these supports as Vitruvius was. They were, doubtless, sufficiently ridiculous in his day. Possibly the notion of such very slight structures originated in the temporary buildings of bamboo used in Eastern festivals; such buildings were probably adorned with flowers, branches of shrubs, sprigs of creepers, ribands and feathers, adorned and hung with balls and little painted tablets.

Pliny describes much of the Pompeian painting as follows ("Nat. Hist." Lib. XXXV., cap. 37):—

"Ludius too, who lived in the time of the late Emperor Augustus, must not be allowed to pass without some notice; for he was the first to introduce the fashion of covering the walls of our houses with most pleasing landscapes, representing villas, porticoes, ornamental gardening, woods, groves, hills, fish-ponds, canals, rivers, sea-shores, and anything else one could desire; varied with figures of persons walking, sailing, or proceeding to their villas, on asses or in carriages. Then, too, there are others to be seen fishing, fowling, or gathering in the vintage. In some of his decorations there are fine villas to be seen, and roads to them across the marshes, with women making bargains to be carried across on men's shoulders, who move along, slipping at every step and tottering beneath their load; with numberless other subjects of a similar nature, redolent of mirth and of the most amusing ingenuity. It was this artist, too, who first decorated our uncovered edifices with representations of maritime cities, a subject which produces a most pleasing effect, and at a very trifling expense."

In some of the old Basilicas at Rome, in St. Mark's at Venice, in Monreale at Palermo, in San Vitale, and in other churches and tombs at Ravenna, we see what must have been the effect of colour in Roman buildings when it was wholly obtained by marble and by marble and glass mosaic, but it is mainly from Pompeii that we see what magnificence can be got by painted decoration. There are, it is true, Pompeian examples of light colouring where the grounds are white or of very light tones, and the best of these are interesting enough and pleasant as a change; but by far the most magnificent instances are where black, dull scarlet, deep crimson, purple, deep orange, and green, form the principal masses of colour. In the house of L. Cæcilius Jucundus, the skirting is high and of a uniform plain green, very like green oxide of chromium, the dado black, the panels a dull scarlet, the frames to the panels of black, and the columns, narrow borders, strings, and the parts which are supposed to show to the open air, of a creamy white. The black dado is enlivened with coloured narrow panels under the columns, and between these light thyrsi are suspended in slanting lines from the top, and are tied on to flags projecting from the panels; flower scrolls grow up from the bottom, and support each of the thyrsi in the middle, and from the point where these last are tied together a tambourine with strings depends; in another part of the dado a lute-shaped piece comes from the bottom in the centre, from the top of which branches of foliage come out and support the sloping thyrsi, and on these last are hung Pandean pipes and a brass dish; the white string above is ornamented at intervals with green and orange; the black band above it has red panels near the columns, with a nar-

rower orange-coloured panel in the middle. Between the red panels there are projections on either hand, like a signboard, particoloured in green and purple and ornamented with white; on scrolls at the angles of the lower part of the centre panel swans are perched, holding festoons in their beaks, on which are peacocks. Above, is a yellow string ornamented with a pattern in green and plum colour. Under the centre picture is a black band, with scrollwork in colours, with elephants' and rams' heads growing out of the flowers, and cheetahs on the scrolls; the white borders have orange, green, and plum-coloured panels of various shapes with heads on them, and ornaments between. The white columns are banded with coloured and ornamented bands, and the two deep bands on them are enriched in the middle, with oval plaques with pendent ear-rings between them. From the large imbricated columns scrolls spring out at intervals, or else the columns are supposed to stand in front of fanciful panels on the ground, and on or within each scroll are goats, deer and birds, and a fawn being devoured by a chimera* or some winged monster. The plain red panels are separated from the outer black borders by a band of yellow network, from which grow star-shaped flowers that bend over on the black; the black is banded twice in its height with plum-coloured bands, on each of which is a beast or bird. In the middle of the upright yellow network a scroll, with flowers and fruit at the end, comes forward on to the black, on which are a griffin and a sphinx; the ground work from these to the red is filled with green and plum colour, which is bordered by a yellow line that forms a segment projecting into the red. It would be endless to describe it all, and I have only gone so far to show you how the colours were broken up, and to show the infinite pains that have been taken to make every part interesting.

Whatever may be said against the taste of the Romans in form, I think every one with a passion for colour must allow that they had a pronounced taste for dignified colour. Merely to read of the colours would give a notion that the effect of them was staring, tawdry, and vulgar, but when seen, all that reads like violent contrasts are so skilfully arranged, proportioned, and toned down by art, that the effect is a superb magnificence.

Since Roman times there have been many superb schemes of decoration, some of the Saracenic for instance, and some of the Moorish. I do not know anything that looks more lovely, and is more entrancing for a short time, than the carved and painted plaster-work of the Alhambra, for, as you shift your position, the different planes of colour come out and produce beautiful varieties of tone and tint and fresh patterns; but at last you weary of this, and there is nothing else to arrest the attention, or rather everything is calculated to turn it in other directions. Nothing at the first view is so likely to attract attention as superhuman complexity, but nothing one so soon sickens of: no one can long delight in interlacing lines, commonplace shapes indefinitely repeated, and coarse carving. In Pompeian work we see a profusion of invention that is quite marvellous, and a beauty of form and colour that makes one linger over each bit when one is satiated with the general effect, though I presume it was mostly done off-hand by provincial artists. These very heads of men and animals that grow out of flowers and so disgusted Vitruvius, charm one by their unexpectedness. And we find fawns and goats, lions, tigers, leopards, and cheetahs, owls, eagles, chimeras, and sphinxes perched on every scroll just as you see goats planted on isolated pinnacles in a rocky country; geese and swans hold up strings and ribands, festoons, or necklaces in their beaks; peacocks, golden pheasants and parrots perch on poles or peck at festoons. Masks, lyres, sistra, flutes, and trumpets, are interspersed with baskets of fruit and flowers; fauns, cupids, and satyrs dance on tight-ropes, and wherever there is a spare place a little picture is introduced. Genii, cupids, bacchantes, dancing and music girls float in the panels; natural flowers grow from the skirting up the dado. Friezes are painted with subjects, sometimes with comic ones, and almost every vessel in household use is utilised for ornament. In some of the subsidiary pictures all sorts of trades and occupations are painted, and these are diversified with landscape or architectural subjects. The main pictures are mostly illustrations of subjects from the Iliad, the Odyssey, the tragic poets, or from old Greek stories. The latest subject shown is the onslaught of Alexander the Great and the flight of Darius at the battle of Issus, in the celebrated mosaic at the House of the Faun. Every hint culled from the curls of creepers, the growth of plants, and from the shapes of flowers was used in the ornament. Necklaces, ear-rings, medallions, and hair-pins were used amongst the ornament, as well as garlands, fillets, thyrsi, feathers, tablets, standards, arms and armour, chased plate, and coffers. The ornaments in colour on glass vessels and on pottery are brought in, here and there gardens with their structures in trellis-work, and garden pavilions are introduced as ornaments on bands or on borders of plain colour.

Never since the days of Pompeii has anything of equal inventiveness and artist i excellence come down to us, with the exception of the paraphrases executed by the Italian artists of the fifteenth and sixteenth centuries. Such decoration can only be carried out where there is enormous wealth, as in the latter times of the Republic, in the days of Augustus, and in those of the early Emperors who succeeded him, or where there is a superabundance of highly-skilled talent, as in the days of the Italian Renaissance. The majolica plates, for instance, now worth their weight in gold, were often painted by first-rate artists who were out at elbows, or who had to escape from the towns they were working, for a shilling or two a dozen, to get a dinner with, while they were waiting for better-paid employment; a few eminent painters have done such work in their own houses for their own delight, as Mr. L'Alma Tadema did in his late house.

If we have such fine work in a little country town, what must have been the work in the most sumptuous rooms of Nero's Golden House on which he squandered all the wealth hoarded by Tiberius, and a good part of the State revenue? Monster as Nero was, there can be little doubt that he was a cultivated connoisseur of the Fine Arts, though singing and music seem to have been his most favoured diversions.

Few of the enormously wealthy men of the day have either the taste, patriotism, or open-handedness to have a few of their state rooms decorated in colour by first-rate artists. Although it is important to keep up the finest possible race of horses, and of dogs, and to practise hospitality, the unconscionable sums squandered on horse-racing, hunting, banquets, equipages, and servants, leave nothing for the encouragement of men of letters, men of science, or of artists. Many writers have said that there would be plenty of Virgils, Horaces, and Livys even now, if Mæcenas could again be brought to life. The Government and the municipalities are far from comprehending the feelings of the working-classes, who would only be too glad to see the public buildings more imposing, and of more magnificent materials, and see them decorated with first-rate painting and sculpture, even though they had to pay another ½d. in the pound. They at least like to see, as well as to feel, the greatness of their country. The few fine rooms that we do see are mostly done for men with very moderate incomes, who love artistic work, and, like the Italian Cardinals, who enriched Italy with palaces, dine on five shillings a day to have money to spend on adorning their houses.

* The Classic chimæra had the head of a lion, the body of a goat, the tail of a dragon, and vomited fire

## BUILDING LEGISLATION:

### ROYAL INSTITUTE OF BRITISH ARCHITECTS.

The eighth ordinary general meeting of this Institute for the present session took place on Monday evening last, Mr. Arthur Cates (Vice-president) in the chair.

The Chairman stated that the President had been invalided by the prevailing epidemic, and obliged to go to the Spanish coast to recruit his health. He hoped the President would return with renewed health and vigour.

The Chairman announced that a Preliminary Examination would be held on March 11 and 12. Forty-two candidates had applied to be admitted to this examination. Of these, seventeen, having satisfied the Board of Examiners, had been exempted, and would at once be registered as Probationers of the Institute. The remaining twenty-five, with the twenty who were relegated to their studies at the last examination, would come up for examination on March 11 and 12, at London, Bristol, and Manchester, the societies at the two latter places having agreed to hold examinations for the candidates resident in those districts.

Mr. John Slater, B.A., then read a paper on "Building Legislation," of which the following is an abstract:—The author said he considered the subject of the greatest practical interest, and that as our great cities were getting greater and more populous year by year, so its importance also increased,—although, speaking generally, it was regarded with apathy by the public at large. Having given statistics showing the enormous and rapid increase of the population of Greater London during the present century,—which increase was almost as great in the manufacturing districts of Lancashire and Yorkshire,—Mr. Slater asked whether the building regulations now in force, not only in the metropolis, but also in the majority of our great cities, were suitable and sufficient for the necessities of the present day. He thought not; and considered that the metropolis ought to have a Building Act which would be a model for other towns. For many years the Roman law, of which nearly all our laws were developments or modifications, referred only to landed property, and not to houses; but about 202 B.C. the population of Rome increased rapidly, and from that period dated laws relating to buildings, and (1) the institution of the party-wall, with its rights and obligations on the owners on each side thereof; (2) regulations as to carrying off rain-water; and (3) rights of light and prospect. Both in Roman and Byzantine regulations powers were found to control the height of buildings. The earliest regulations in the metropolis were Fitz-Aylwin's Assize of Buildings, passed in the first year of Richard I., exactly 700 years ago, the general intention of which was very similar to that of the present Building Act. The author then gave some interesting quotations from these regulations, which were to be found in the Liber Albus of the City of London, compiled in 1419 by John Carpenter, the Town Clerk. He then briefly referred to several Acts, down to that of 1844, which though manifestly imperfect, was in many of its provisions superior to the 1855 Act. (1) It provided a special court of appeal; (2) it placed the buildings, which were now entirely exempted from all superintendence, under special supervision; (3) the regulations as to carrying out work to any party structure were less likely to lead to dispute than in the existing Act; (4) it contained regulations as to drainage and as to width of streets, which certainly ought to be comprised in any Building Act; and (5) it contained better and more complete regulations as to footings of walls than the present Act or by-laws. There were at present no fewer than fourteen separate Acts in force in the metropolis, while the County Council were promoting a Barking Creek Bill, containing other amendments affecting building law. It was essential that all regulations as to streets and buildings should be codified and embodied in a single document, and that piecemeal legislation should cease. The Act should regulate the width, construction, sewerage, and gradient of all new streets, the line of frontage of the houses, and should provide for a sufficient number of adequate open spaces. It should define clearly the difference between public and private buildings; should exercise control over the situation and construction of the former, and the means of ingress and egress. To secure the prevention of fire, due stability, and healthiness in all buildings, it should control the site; the construction of foundations, walls, floors, roofs, and chimneys; the drainage; the amount of space about a building; and the height of the building in connexion with its position. It should provide an executive for carrying out its provisions, and a special court of appeal for all disputed matters. Regulations as to noxious trades, infectious diseases, common lodging-houses, &c., should be relegated to a special sanitary code, as in New York.

Mr. Slater then dealt at considerable length with the foregoing points one by one. The present regulation as to the width of new streets—that they shall be at least 40 ft. wide—was not sufficient; for a much-used thoroughfare there should be a carriage-way not less than 42 ft. The definition of a public building should be as wide as possible, and none

should be allowed to be erected with a frontage to one street only. The Manchester new draft Bill contained many improvements, and he congratulated the Manchester Society of Architects upon the result of their representations to the Corporation. The restriction as to cubical contents was unnecessary as a hard-and-fast rule, and there ought to be a discretionary power of allowing larger buildings to be erected, if the authorities were satisfied with their construction. With the increased knowledge of the behaviour of stone and iron under heat, it was absolutely criminal to allow stone staircases carried on unprotected iron supports in buildings used as flats; and, in fact, all the provisions as to fire-resisting construction needed remodelling. The securing of due stability was an important point, and perhaps the most crying defect in the Buildings Acts was that the controlling officers had no power whatever over the materials used other than bricks and mortar. It would not be difficult to frame a schedule which should stipulate, for instance, that lead for gutters should be of not less than, say, 5 lbs. per foot super.; that zinc should be not less than 16 ozs., &c. It was also time that some regulations as to the use of iron in buildings should be laid down—such as, for instance, the minimum depth of a girder spanning a certain opening. If such details were not to be provided for, then the superintending officials should be empowered to satisfy themselves as to the stability in each individual case, and be made responsible. With regard to drainage, he thought the sanitary officers of the various vestries did their duty well; but he considered a divided control unwise, and that the same officer should be responsible for both the erection of the building and its sanitation. Provision should be made for underground rooms being, to a certain extent, protected from the damp, either by the walls being built in cement or by forming a dry area. The close juxtaposition of the houses was a great evil in large cities, and a regulation prescribing a minimum distance between the backs of all houses, large or small, was most urgently needed. The existing provision was positively ridiculous, because it simply prescribed the *area* of the open space in the rear of a building. The minimum depth of that open space should depend on the height of the house, and should be at least equal to it. In the case of buildings facing public streets, the width of the street should govern the height of the house as a general rule, as in Paris, in nearly every city of the German Empire, and in Sweden. In the last-mentioned country streets 32 ft. wide and less might have houses 43 ft. high; up to 44 ft., houses 54–56 ft. high; and streets about 44 ft. might have houses 66 ft. high. Such stipulation was eminently reasonable, but power should be given to relax the rule in certain cases, provided the construction satisfied the controlling officer of the Building Department as to fire resistance, stability, &c. In order to avoid a monotonous sky-line a clause might be framed to the effect that if the front of a building be carried up as a gable, then the limit should apply not to the apex, but to half-way up the gable. The regulation of the relations between adjoining owners as to works to party structures was then dealt with, and reference made to the 1844 Building Act, which had a very wise provision, under which, if the adjoining owner did not give his consent, the matter was referred to the District Surveyor, who was required to report on the matter to the court of appeal. With reference to light and air, a clause to the effect that a building owner should give notice of rebuilding to all parties who could be affected, and their surveyors empowered to investigate the matter and to decide by a majority whether the building would injure any one, and, if so, the compensation to be paid, or to absolutely veto the proposed rebuilding, would be an immense gain to a Building Act in a large city.

Even with a liberally-conceived, comprehensive Building Act, well drawn and lucid in its provisions, disputes would certainly arise. To whom were these to be referred? The great desideratum was that machinery for enforcing the law should be simple, direct, efficient, and inexpensive, and that there should be uniformity of procedure. At present it was precisely the reverse; and a special tribunal should be created fit to deal with building disputes. Having quoted clause 80 of the 1844 Building Act, Mr. Slater referred to a report of the late Mr. Justice Mellor and the late Mr. Joseph Gwilt, who recommended that a tribunal should be constituted, consisting of two persons, one belonging to the legal and one to the architectural profession; and he believed, if due care were exercised in the selection of the individuals, this would form a very strong court. Referring to the administration of a Building Act, he considered a body like the District Surveyors should jealously guard against abuses; but there could be little doubt that abuses had crept in. If it were true that one District Surveyor had held office for years after he was totally unable to climb a ladder, his duties being done by a clerk—if it were a fact that another found two hours a week sufficient for the personal administration of a large district, nineteen-twentieths of the work again being done by a clerk—it was truly a state of things certainly not contemplated by the framers of the Building Act, and it was no wonder that the office had fallen somewhat into disrepute in the eyes of the County Council. But the greatest defect was incidental to the Act itself; it did not allow the District Surveyors to exercise the slightest discretion, or to take the least responsibility beyond seeing that the bare letter of the law was insisted upon. Many surveyors felt the absurdity of their position, and gave themselves a great deal of trouble, when they saw this insistence would inflict undoubted hardship, in order to minimise that hardship; but others would never budge an inch from the *littera scripta*. If the surveyors were armed with discretionary powers, to be exercised on their own responsibility, they would always take care to have good reasons both for permissions and refusals; and such an alteration in the law would surely be welcome to all. In conclusion, Mr. Slater said the London County Council had not yet given due attention to the reform of the Building Acts; but it was essentially a matter for the Municipal Parliament to take up: and he looked forward confidently to the day—in the not far-distant future—when this great metropolis would be administered in accordance with the regulations of a model Building Act, and when London, in addition to being the largest, would be in a fair way to become (as she easily might) the best arranged, best built, most sanitary, and generally most magnificent city in the world.

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The Chairman, in inviting discussion on Mr. Slater's paper, said that as he believed several gentlemen wished to speak at great length, and as the time at their disposal was rather short, they would not be able to conclude the discussion that evening. He therefore thought it would be well to adjourn the discussion at the close of the meeting to the 3rd of March.

Mr. E. C. Robins said that the paper was one of great interest to those who were endeavouring to do their duty to the public at the present time. He agreed with a great deal that Mr. Slater had said, and the question of the heights of buildings was one which had always had attractions for him. He believed London was suffering from a plethora of buildings by no means suited to the position in which they were found, and which were getting out of all scale. Another important question, too, was that of air-space, and the building in Broadhurst-gardens, referred to by Mr. Slater, were a case in point. In a great city like London it was difficult to lay down hard and fast rules, but if they got a set of principles recognised by a body constituted for that purpose, it could not fail to effect a great improvement in the Building Act. There ought to be a consolidation of the Sanitary as well as of the Buildings Acts, and instead of permissive clauses, allowing public bodies to do certain things, there should be positive clauses enacting that they should be done. The independence and the proper qualification of sanitary officers was especially needed.

Mr. Henry Dawson said he rose because he could see there was a very urgent necessity for some action being taken on account, not of the committed acts of the County Council, but on account of their omissions. He referred to a most important announcement they had made—he did not say officially, although it was in some respects what might be called official—that they did not intend in future to exercise the power given them under the Metropolitan Building Act of 1855—to allow any excess of openings over solids in external walls giving light to buildings, and that they would not allow any departure from the strict letter of the 13th Section.

The Chairman: Which says that the openings shall not exceed one-half.

Mr. Dawson continued that the 13th Section of the old Act required that the openings in any external wall should not exceed the area of the solids. In cities like London, Glasgow, or Edinburgh, the areas, limited not only sometimes in front, but at the rear of the buildings, made it positively necessary that the openings should exceed the area of the solids. The County Council, in their supposed wisdom—but what he would rather call their ignorance,—had put it forth that they did not intend in future that the external walls should have openings in them greater in superficial area than half of the entire elevation. Now that would really be a serious hindrance to all building, and he did not know any body so well fitted as that Institute to take urgent measures, in connexion with other bodies, before Parliament or otherwise, if the County Council persisted in their attitude on this question. They ought to be allowed to have the openings of any size, so long as the construction should be declared sufficient to carry the weights intended to be carried. In a city like London, the access of light to buildings was the one essential thing, not merely for health, but for the purpose of carrying on trades and manufactures of various kinds. He was aware that this subject was under the consideration of the Practice Standing Committee of the Institute, and provided that they were really proposing to do something practical in the matter, he did not desire to push it any more than was necessary. But he would most earnestly urge upon the Council of the Institute that they should certainly put their shoulders to the wheel and insist that such a ridiculous clause as section 13 should no longer be insisted upon where not necessary. He was glad that the discussion on the paper was to be postponed until March 3, but this matter should not be left even until then. Some protest should be made in regard to the Bill of the County Council, and to obtain some provision which would prevent the necessity for insisting upon the clause he had referred to.

Mr. Charles Fowler proposed a vote of thanks to Mr. Slater for his excellent paper, which he considered very opportune when the London County Council were making certain propositions for the amendment of the existing Building Acts. It gave them the opportunity of making representations to the London County Council as to what their views might be, which in itself was an advantage. He had marked a few matters which Mr. Slater had mentioned in his paper. Mr. Slater had stated that the first time when Building Surveyors,—now termed District Surveyors,—were appointed was under the Act of George III., but he (the speaker) had always understood that the Act of Charles II. appointed Building Surveyors in London. As architects they would all agree that the regulation of the height of buildings in streets was most desirable. They might certainly differ as to the proportions of the height to the width of the streets, but they would all agree that it should be regulated. There was at present a certain number of regulations, only applicable, however, to new streets, and power was vested in the old Metropolitan Board of Works, whose authority had been transferred to the London County Council, to exercise a discretionary power, though some might imagine that they had not exercised it wisely in regard to Northumberland-avenue. It appeared from Mr. Slater's paper that the Romans thought it a desirable thing to regulate the height of buildings, and we had, therefore, excellent authority for following in the steps of such a very practical people. Mr. Slater had mentioned the Act of Charles II., in which buildings were classed by rates, as was the case up to the time of the present Act, when the rates of buildings were superseded with reference to the heights and lengths of walls. Mr. Slater seemed to think that the regulations with regard to party structures in the Act of 1844, which was superseded in 1856, were better in one respect than those which now existed. He also seemed to think that they led to less litigation, and that such matters were more easily settled in former days. He (the speaker) confessed he was not old enough to have acted under the old Act for a sufficient length of time to have had experience of the advantage of the regulations, but he should think the reverse was the case. It did not seem to him desirable to refer those questions, arising between adjoining owners, to the District Surveyor, but rather that they

should be left to a sort of civil settlement by each adjoining owner appointing a person to represent him, they, of course, appointing an umpire in case they did not agree. He confessed that, notwithstanding occasional failures, it appeared to him that the present method for settling party-wall cases was very good, and he fancied it could hardly be improved upon. Mr. Slater, in another part of his paper, had referred to a special tribunal, and most of them would think that such a tribunal would be an exceedingly desirable thing if they could get it. It was one of those things, however, which the House of Commons had the very greatest objection to, and certainly in the case of the Building Act their objection did appear to be warranted, because it was notorious that the Official Referees under the late Building Act were anything but successful. If they could get the principle admitted,—if the House of Commons would admit the principle,—then the questions might be discussed. He ventured to think that what Mr. Slater suggested, and what was suggested under the former Act, by those gentlemen who had to report, was not what he should have thought most likely to be successful. The architects would require a legal person to formulate their decisions, and he should have thought, if there had been a judge appointed with two professional architects as assessors, that would be more likely to work than having one of each profession, who, if they differed, would have great difficulty in settling the case. He considered that two architects, acting as assessors to a barrister, sitting as a judge, would be more likely to form a successful tribunal, and one which would commend itself to the whole of the profession. The subject of giving discretion to the County Council, who should have certain powers under the Act, was one of very great difficulty. If the powers of the County Council were qualified by the necessity of giving some reason for their decisions in certain cases, the result would no doubt be better. A body invested with so much discretionary power, which could be exercised by the majority of those attending, was a very dangerous tribunal indeed. But, if the Council had to give reasons for allowing or disallowing certain things, it would bring itself under the control of public opinion, as far as those decisions became public, and in that way any tendency to abuse which might arise would be very much checked. He considered the discretionary power in a great many things could be safely vested in the London County Council, subject to certain restrictions. Mr. Slater had slightly touched upon the regulation of other matters in the Building Act besides the mere thickness of walls. He was sorry to say that he had not sufficient time to look up some of the Provincial Acts, particularly that applying to Liverpool. That Act, he always understood, was framed under the advice of the late Sir William Tite, and he believed that it contained certain schedules with reference to the thickness of joists, girders, and so on. Those schedules appeared to work very well, and they might to a certain extent be embodied in a Metropolitan Building Act. The difficulty was very great in framing such schedules, but with competent advisers it might be done. In the case of iron girders certain weights per foot run might be assigned to certain spans, and if the regulations were framed under competent advice, he could quite imagine it could be done with advantage. With regard to officials to carry out the regulations of the Building Act, Mr. Slater had complimented the District Surveyors a good deal, by suggesting that discretionary powers should be given them in a great many instances. He was afraid, however, that many people were much averse to giving official personages very considerable discretionary powers. They seemed to have a tendency to distrust the discretion of individuals; but he believed that to give a competent and reliable set of officials discretionary powers would be a great advantage.

Professor Kerr hoped that at the adjourned meeting, on March 3, the questions before them would be thoroughly discussed. He would only at present draw attention to one very excellent institution, which seemed to have been rather overlooked by Mr. Slater, namely, the District Surveyors' Association, which was, practically, a court of private appeal in all matters referring to the Building Act, and, he could testify, was one of the most useful institutions the profession possessed. The gentlemen composing it were associated together for the purpose of avoiding everything like a stumbling-block to the efficient performance of their duties as servants of the public. Consequently, when any one had a difficulty with a District Surveyor, he should always ask him to refer it,—and he was bound to do so—to the District Surveyors' Association. A committee would be found there composed of very intelligent men, and they gave their very best attention to all disputed matters submitted to them. If his opinion was worth anything, it might be taken as an assurance that any question which was submitted to that very large committee would be treated in a fair and reasonable spirit. He therefore hoped that in the coming discussion due weight would be given to the existence of that body, as a means of settling disputes without going to the magistrate. He had also always been in favour of the late Metropolitan Board of Works, and now of its successor the London County Council, usurping authority if they did not possess it, in order to get over such difficulties as must constantly occur in the administration of the Building Act. He did not believe that any court of law would object to Mr. Blashill being indirectly vested with power to give his decision upon many questions in dispute, which would be thus intercepted on their way to the Law Courts.

The Chairman: I understand you will take part in the discussion at the adjourned meeting?

Professor Kerr: Yes.

Mr. Edwin T. Hall said that the Practice Standing Committee of the Institute had those matters very fully before them. They had had a Sub-committee dealing twice with the subject already, and he held in his hand a draft document which contained some seventy suggestions for the amendment of the Building Act, and it was probable that on the following day the Committee might authorise the publication of this document in the Institute's *Journal of Proceedings*, as a text to bring the subject to the notice of members. He hoped that every member of the Institute would forward to the Committee any suggestions they might have to make in regard to difficulties they had experienced and as to amendments which they desired to see adopted. These would be taken into consideration at once. He might say that the Practice Standing Committee had received the greatest assistance from the District Surveyors' Association, on more than one occasion, in dealing with matters connected with the Metropolitan Building Act.

The Chairman said he thought it was very desirable that the suggestions referred to should be printed in the *Journal of Proceedings* to be issued on the following Thursday.

Mr. Hall replied that no doubt they would be ready for publication.

The Chairman said he also considered that Mr. Slater's paper should form the foundation of action by the Institute on the matter before them. It might be in the knowledge of the members that the President of the Local Government Board had under consideration a Bill for the consolidation of all the sanitary legislation of the metropolis. That was announced in the Queen's Speech, and there was one section of the legislation, to which Mr. Slater had alluded, now under consideration. Therefore the present would be an opportune moment for bringing before the notice of the Government the absolute necessity for some legislation for building, on the lines suggested by Mr. Slater.

Mr. E. T. Hall said that, incomplete as was the text he had referred to, it would pave the way for a good discussion at the adjourned meeting, and if members would communicate their suggestions to the Committee it would enable them to prepare a document more or less complete, which would be of great service to the London County Council and the public generally.

The Chairman remarked that, if the suggestions could not be published in the *Journal of Proceedings* that week, he believed it would be well to send them round to the members in a printed form.

Professor T. Roger Smith moved that Mr. Slater's paper should be printed and circulated amongst the members before the next meeting.

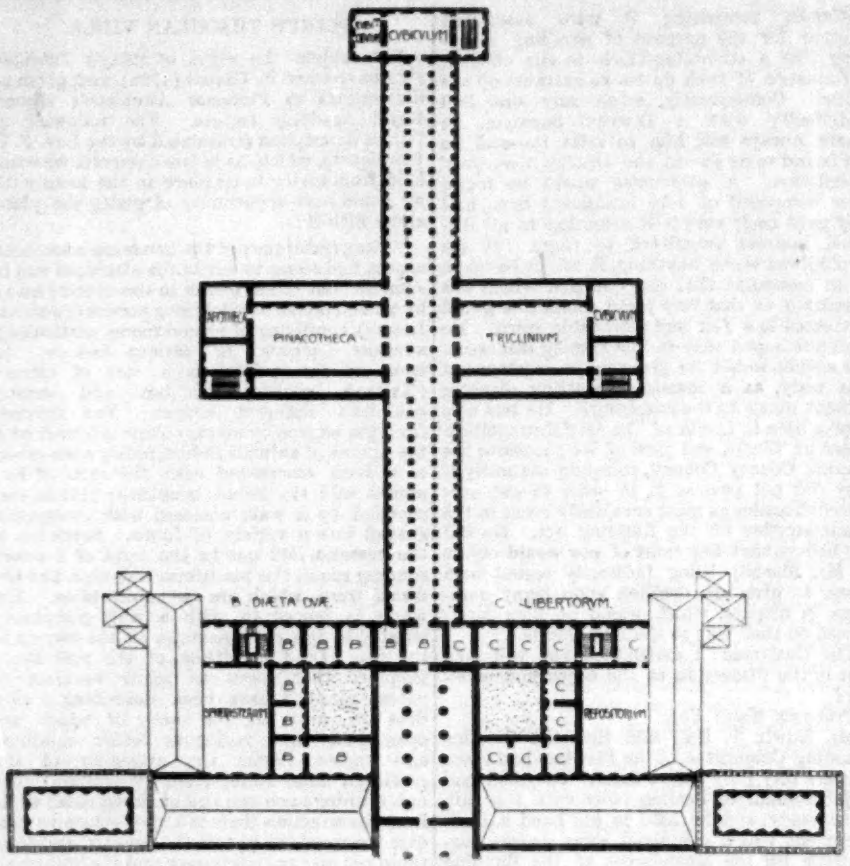
Mr. Rickman seconded the motion, which was unanimously agreed to.

Mr. Hall moved the adjournment of the debate to the 3rd of March, and the meeting then stood adjourned.

## PLINY'S TUSCULAN VILLA.

WE subjoin the plans of Pliny's Tusculan villa as restored by Castell (1728), and given as illustrations to Professor Aitchison's second Royal Academy lecture. The following is Pliny's description (translated by the Rev. F. T. Bosanquet), which, as before observed, we withheld from giving in its place in the lecture till we could have opportunity of giving the plans along with it:—

"The greater part of the house has a southern aspect, and seems to invite the afternoon sun in summer (but rather earlier in the winter) into a broad and proportionately long portico (Porticum Latum), consisting of several rooms, particularly a court (Atrium) of antique fashion. In front of the portico is a sort of terrace (Xystus), edged with box and shrubs, cut into different shapes. You descend from the terrace by an easy slope adorned with the figures of animals in box, facing each other, to a lawn overspread with the soft—I had almost said the liquid acanthus; this is surrounded by a walk enclosed with evergreens, shaped into a variety of forms. Beyond it is the gestatio, laid out in the form of a circus running round the multiform box-edge, and the dwarf trees, which are cut quite close. The whole is fenced in with a wall completely covered by box cut into steps, all the way up to the top. On the outside of the wall lies a meadow that owes as many beauties to nature as all I have been describing *within* does to art; at the end of which are open plain and numerous other meadows and copses. From the extremity of the portico, a large dining-room (Triclinium) runs out, opening upon one end of the terrace; while from the windows there is a very extensive view over the meadows up into the country, and from these you also see the terrace and the projecting wing of the house, together with the woods enclosing the adjacent hippodrome. Almost opposite the centre of the portico, and rather to the back, stands a summer-house (Diæta), enclosing a small area shaded by four plane-trees, in the midst of which rises a marble fountain (Labrum), which gently plays upon the roots of the plane-trees and upon the grass plots underneath them. This summer-house has a bedroom (Dormitorium cubiculum) in it, free from every sort of noise, and which the light itself cannot penetrate, together with a common dining-room (Cœnatio) I use when I have none but intimate friends with me. A second portico looks upon this little area, and has the same view as the other I have just been describing. There is, besides, another room, which, being situate close to the nearest plane-tree, enjoys a constant shade and green. Its sides are encrusted with carved marble up to the ceiling (podio tenus), while above the marble a foliage is painted with birds among the branches, which has an effect altogether as agreeable as that of the carving, at the foot of which a little fountain, playing through several small pipes into a vase (Crater) it encloses, produces a most pleasing murmur. From a corner of the portico you enter a very large bed-chamber (Cubiculum) opposite the large dining-room (Triclinium), which from some of its windows has a view of the terrace, and from others of the meadow, as those in the front look upon a cascade, which entertains at once both the eye and the ear, for the water, dashing from a great height, foams over the marble basin which receives it below. This room is extremely warm in winter, lying much exposed to the sun, and on a cloudy day the heat of the adjoining stove (Hypocauston) very well supplies its absence. Leaving this room you pass through a good-sized pleasant undressing room (Apodyterium) into the cold-bath room, in which is a large, gloomy bath; but if you are inclined to swim more at large, or, in warmer water, in the middle of the area stands a wide basin for that purpose, and near it a reservoir from which you may be supplied with cold water to brace yourself again, if you should find you are too much relaxed by the warm. Adjoining the cold bath is one of a medium degree of heat, which enjoys the kindly warmth of the sun, but not so intensely as the hot bath, which projects farther. This last consists of three several compartments, each of different degrees of heat; the two former lie open to the full sun; the latter, though not much exposed to its heat, receives an equal share of its light. Over the undressing-room is built the tennis-court, which admits of different kinds of games, and different




UPPER PLAN.

A PORTICVS
B ATRIVM.
C TRICLINIVM.
D AREOLA
E DORMITORIVM CVBICVLVM
F CÆNATIO
G PORTICVS ALIA.
H CVBICVLVM.
I CVBICVLVM AMPLISSIMVM.
K APODYTERIVM.
L CELLA FRIGIDARIA
M CELLA MEDIA
N CELLA CALDARIA

a TABLINVM
b PROPNICEON.
c HYPOCAVSTON
d VNCTVARIVM
e SCALÆ.
f BIBLIOTHECA
g BASILICA
h CVLINA
i CARNARIVM
k FVRNVS.
l APOTHECA VINA
m CELLÆ SERVORVM
n PROCÆTON.

O SCALÆ QVÆ IN CRYPTOPORTICVM FERVNT
P DIÆTA QVÆ VILLÆ HIPPODROMVM ADNECTIT
Q SCALÆ.
R CRYPTOPORTICVS SUBTERRANÆ SIMILIS
S PORTICVS ANTE MEDIVM &c.
T DIÆTÆ QVÆ.

GROUND PLAN.

*Plans of Pliny's Tusculan Villa, as Restored by Castell in* 1728.

sets of players. Not far from the baths is the staircase (Scala), leading to the enclosed portico (Cryptoporticus), three rooms (Diætæ) intervening. One of these looks out upon the little area with the four plane-trees round it; the other upon the meadows, and from the third you have a view of several vineyards, so that each has a different one, and looks toward a different point of the heavens. At the upper end of the enclosed portico, and, indeed, taken off from it, is a room (Cubiculum) that looks out upon the hippodrome, the vineyards, and the mountains; adjoining is a room (Cubiculum) which has a full exposure to the sun especially in winter, and out of which runs another (Diæta) connecting the hippodrome with the house. This forms the front.

On the sunny side rises an enclosed portico, which not only looks out upon the vineyards, but seems almost to touch them. From the middle of this portico you enter a dining-room (Triclinium) cooled by the wholesome breezes from the Apennine valleys; from the windows behind, which are extremely large, there is a close view of the vineyards, and from the folding-doors, through the summer portico (Cryptoporticus). Along that side of the dining-room where there are no windows, runs a private staircase for greater convenience in serving up when I give an entertainment. At the farther end is a sleeping-room (Cubiculum), with a look out upon the vineyards, and (what is equally agreeable) the portico underneath this room is an enclosed portico, resembling a grotto, which, enjoying in the midst of summer heats its own natural coolness, neither admits nor wants external air. After you have passed both these porticoes (Cryptoporticus), at the end of the dining-room stands" (this is hardly a translation, Pliny says "begins the portico") "a third, which, according as the day is more or less advanced, serves either for winter or summer use. It leads to two different apartments (Diætæ), one containing four chambers, the other three, which enjoy by turns both sun and shade." I have omited the east summer-house.

Houses are built not only to protect people from the inclemency of the weather, but to afford conveniences for the avocations they pursue, and for the recreations they indulge in; so there is no need of apology for giving the account of how Pliny passed his time there.

## Illustrations.

### ILLUSTRATIONS OF CAMBRIDGE.

WE give in this number reproductions in ink-photo of two of Mr. Fulleylove's charming series of water-colours of Cambridge which, as before noticed, are now being exhibited at the Fine Art Society's Galleries. These of course do not convey the charm of colour which belongs to many of these drawings, to none more than to that of "The Conduit" which is such a well-known object in the centre of the great court of Trinity College. Architecturally perhaps "Wren's Bridge," giving access to John's College from "the backs," is the more interesting; with the gate and gate-piers it forms an effective contrast, in its quiet stateliness of effect, with the more homely and domestic character of the residential buildings.

It is curious to see the Gothic feature of the sloped set-off in the bridge buttresses, introduced here for practical reasons as the easiest way of connecting the necessary cut-water form, on the up-stream side of the pier, with the pilaster above.

### WREXHAM CHURCH TOWER.

THE peculiar interest of the fine tower at Wrexham (which we may observe is not actually in Shropshire as stated in the plate title, but in Denbighshire, though not far from the Shropshire border) consists in the fact that in style, proportion, and general architectural treatment it is essentially a Somersetshire Tower which has found its way north by some accident, and acts as a surprise in this respect to the architectural traveller and sketcher, who is not expecting to meet anything of this character on the north-east border of Wales. Whether there was any local reason, any connexion with Somersetshire at the time, to account for this, there is no record.

Mr. Arnold Mitchell's drawing reproduces very faithfully the design and architectural effect of this interesting tower.

### CHISWICK PARISH CHURCH.

THE window to-day illustrated is the centre one of three on the N. side of Chiswick Parish Church, the design of which was required to illustrate the building of Solomon's Temple.

*Centre window.*

David with plan of Temple.
Solomon with model of Temple.
Hiram, King of Tyre.
The Chief Priest (Zadok).

Through the base of the four lights a small processional subject of the dedication of the Temple.
Solomon. The Elders of Israel.
The bearers of the ark and a band of choristers.

The first and third windows are designed to complete the scheme. SHRIGLEY & HUNT.

*** The drawing from which the illustration is taken was exhibited in the Royal Academy Exhibition of 1889.

WREXHAM TOWER, SHROPSHIRE.—From a Drawing by Mr. Arnold B. Mitchell, A.R.I.B.A.

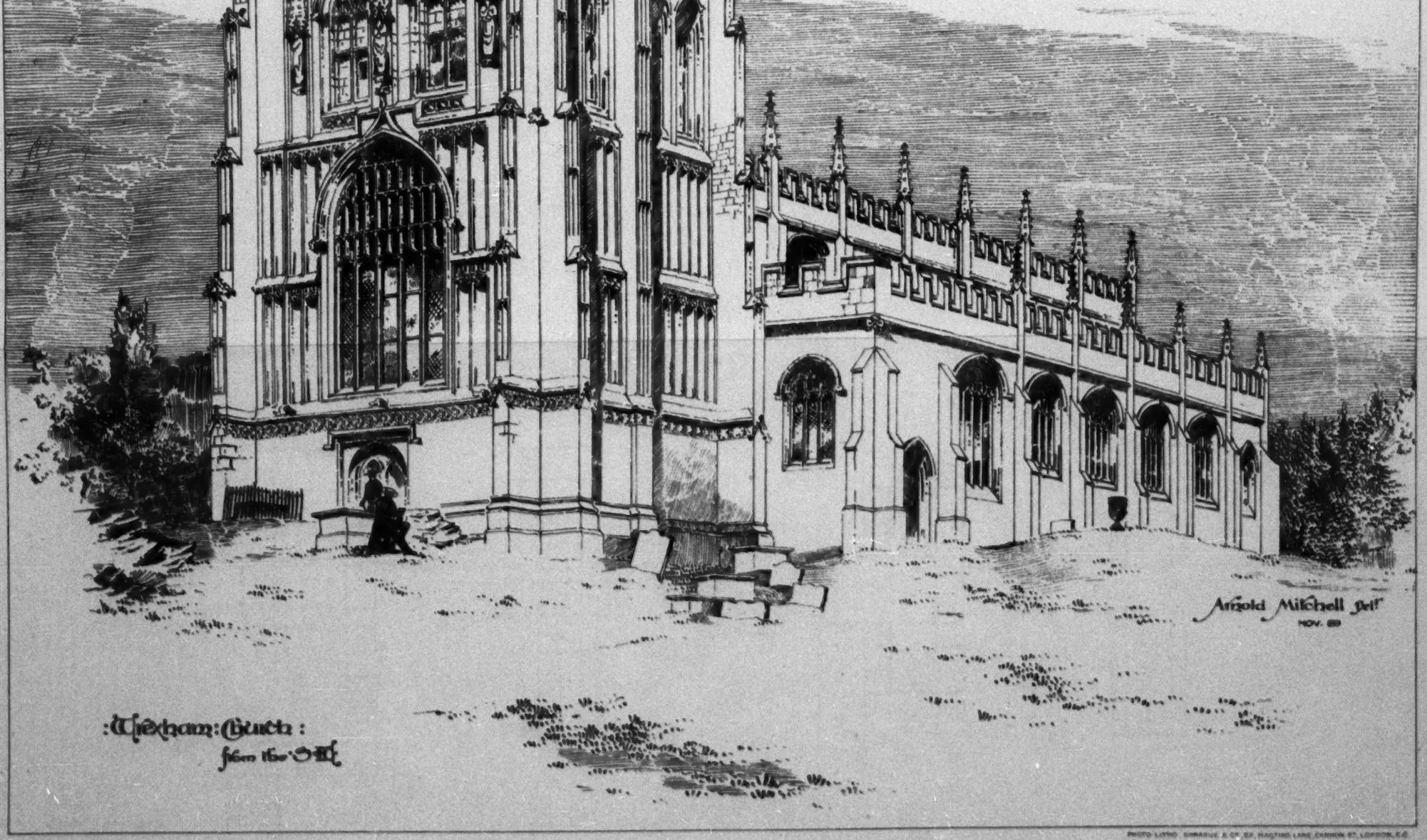
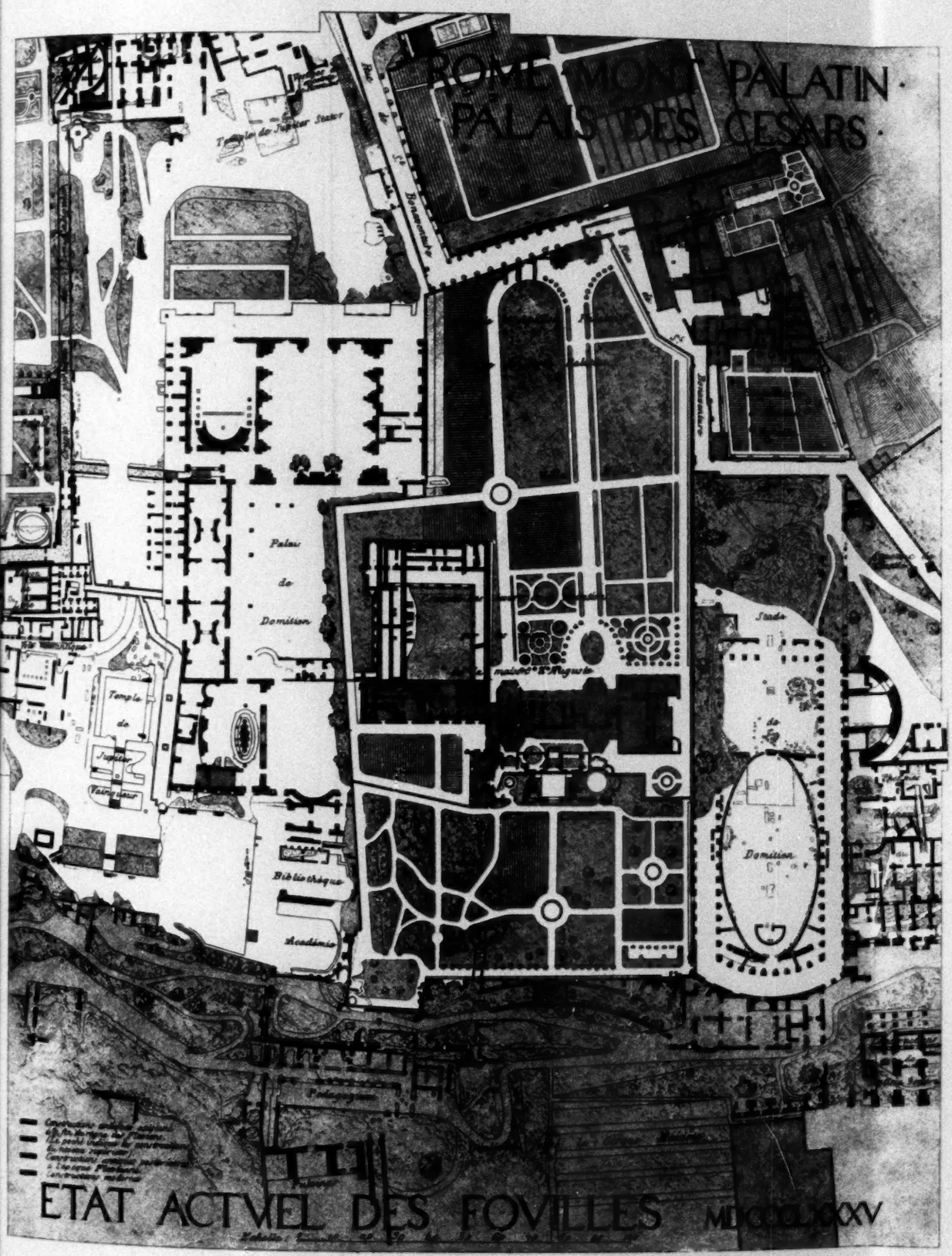



PHOTO LITHO SIMMONS & CO. 22, HASTING LANE, CANNON ST. LONDON, E.C.

WREXHAM TOWER, SHROPSHIRE.—From a Drawing by Mr. Arnold B. Mitchell, A.R.I.B.A.




THE PALACE OF THE CÆS

PLANS OF EXISTING REMAINS AND RES

*Reproduced from the "Moniteur de*

IN ILLUSTRATION OF PROFESSOR AITCHISON'

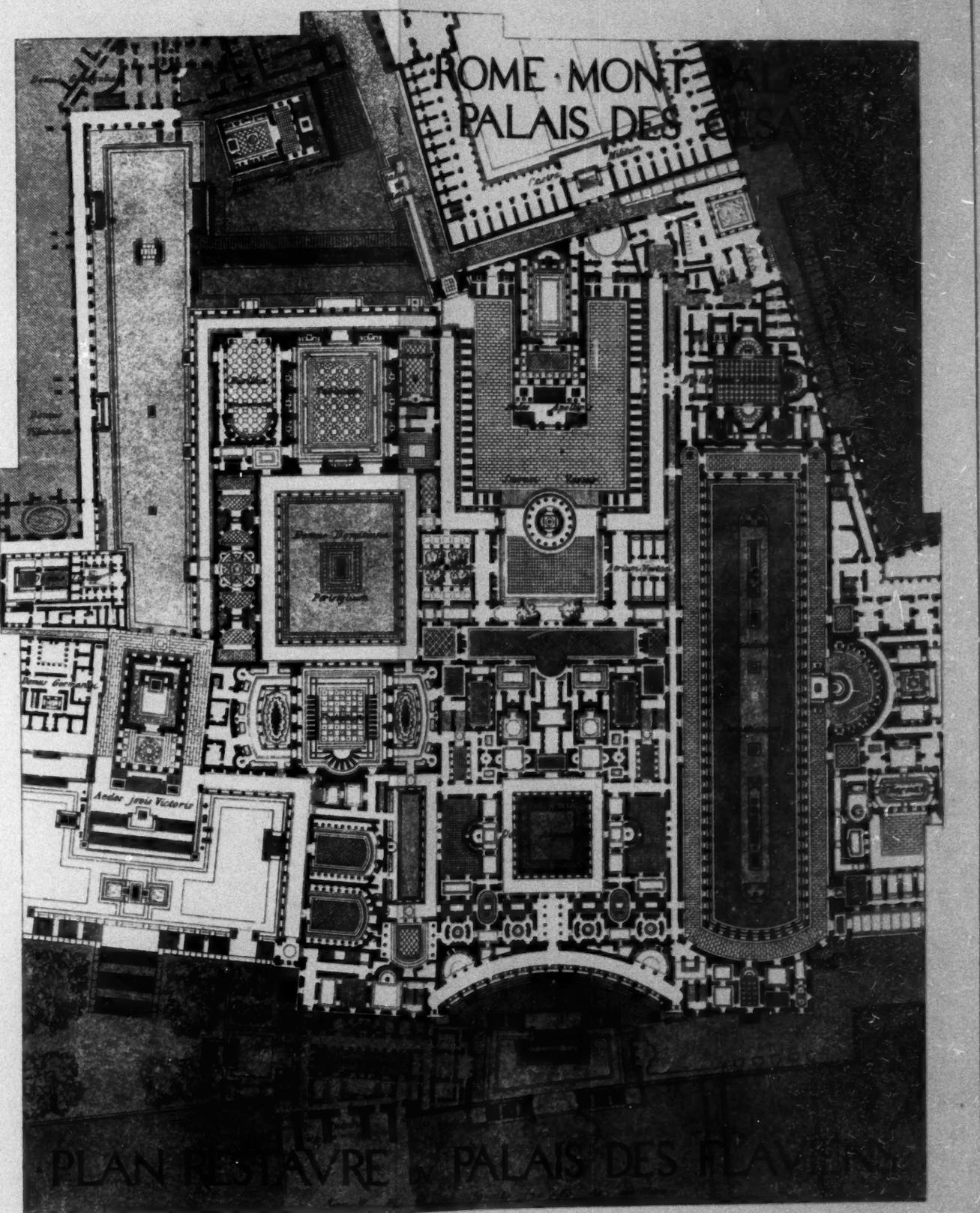


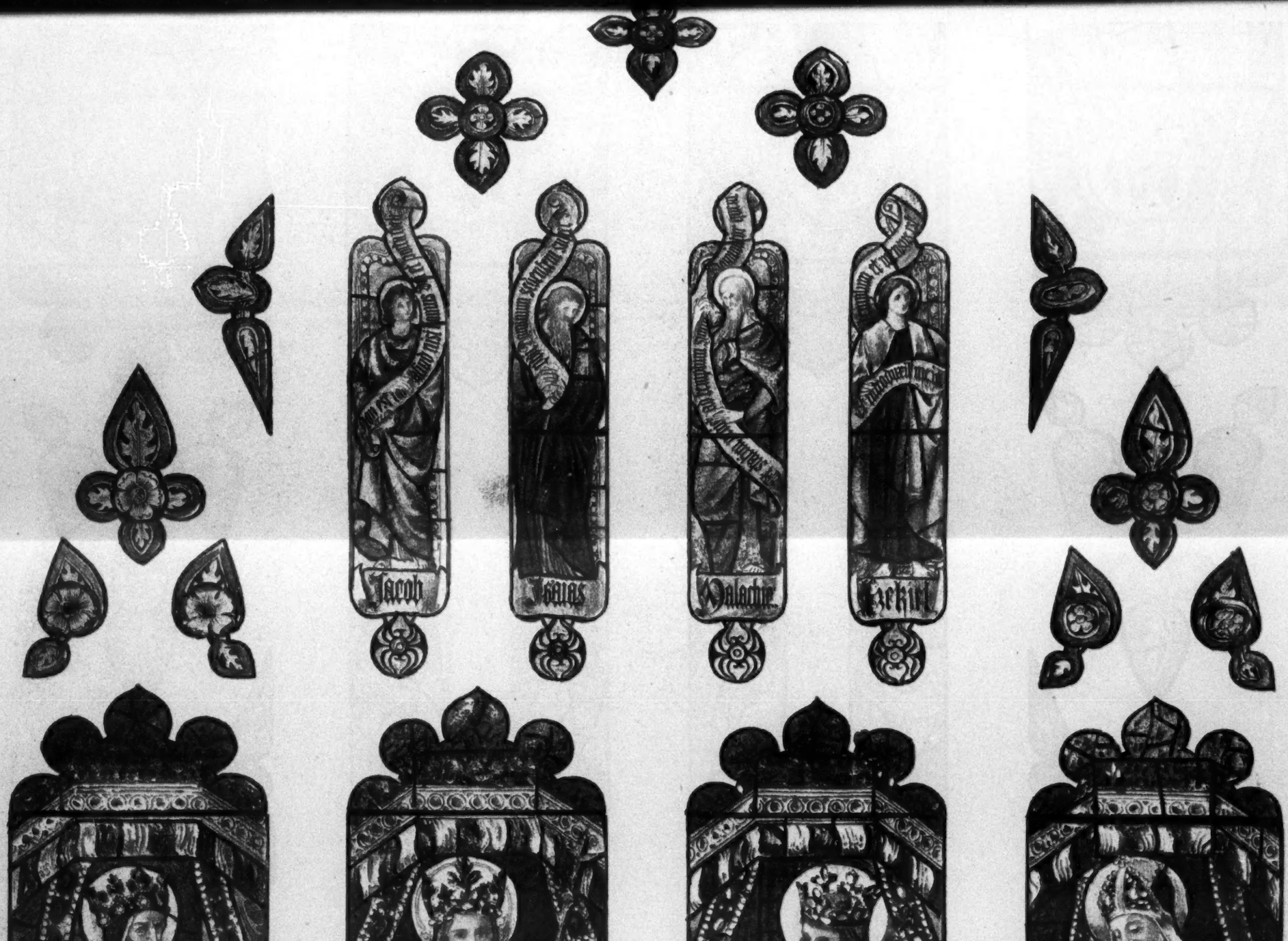

PHOTO-LITHO. SPRAGUE & CO., 112, MARTINS LANE, CANNON ST., LONDON, E.C.

E CÆSARS, ROME:

D RESTORATION BY M. DEGLANE,

*niteur des Architectes,*"

CHISON'S ROYAL ACADEMY LECTURES.


Jacob
Josias
Ezekiel

Rex David

Salomon Rex

Hiram Rex Tyri

Sadoc Sacerdotis

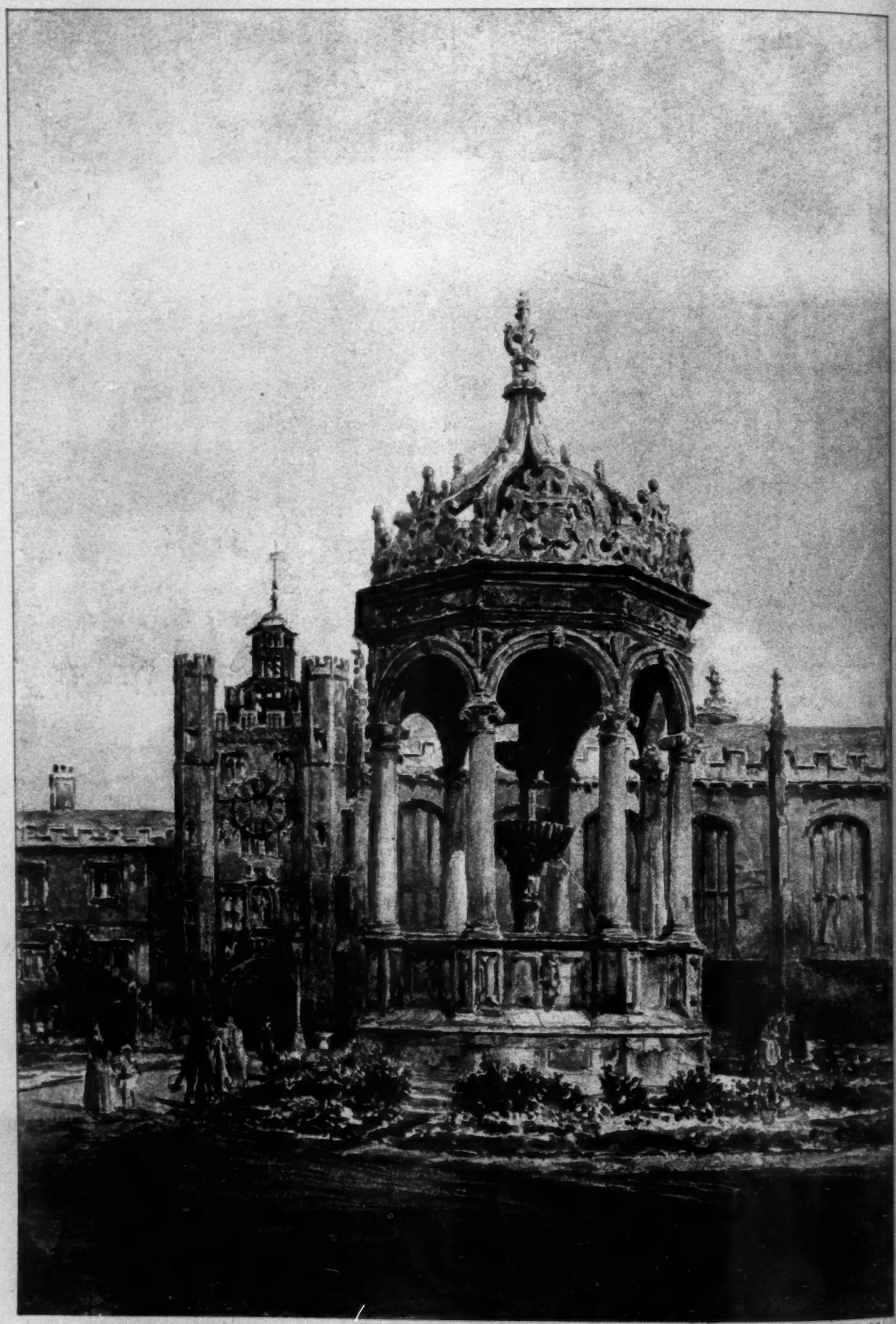
Jacob

Isaias

Malachie

Ezekiel

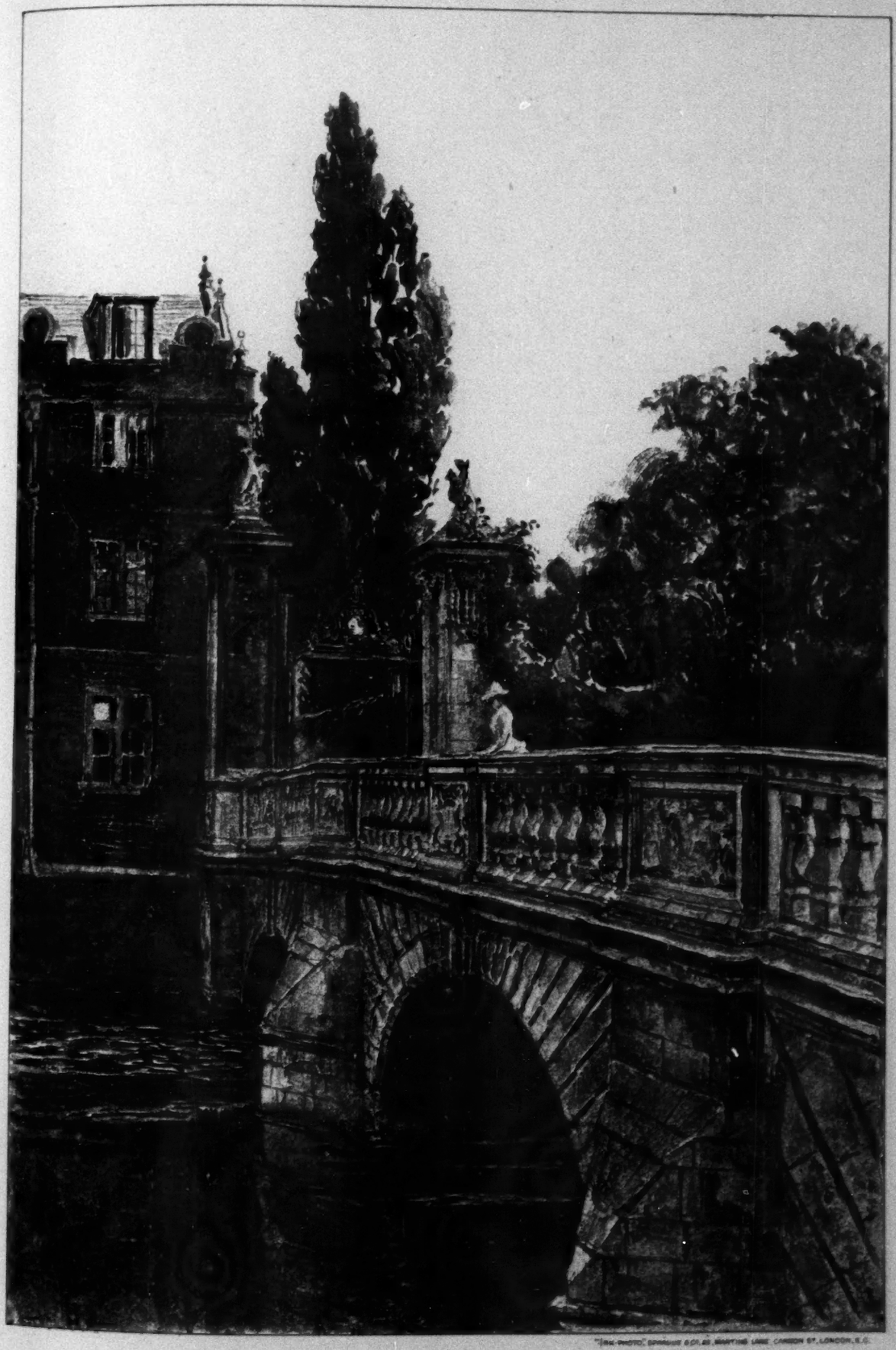
WINDOW, CHISWICK PARISH CHURCH.—By Messrs. Shrigley & Hunt.



"IRX-PHOTO," SPRAGUE & CO., 62, MARTINS LANE, CANNON ST., LONDON, E.C.

THE CONDUIT, GREAT COURT, TRINITY COLLEGE, CAMBRIDGE.

*From a water colour drawing by Mr. John Fulleylove.*



WREN'S BRIDGE, ST. JOHN'S COLLEGE, CAMBRIDGE.

*From a water colour drawing by Mr. John Fulleylove.*

## PLAN OF THE PALACE OF THE CÆSARS.

THESE are reproduced, by permission, from the measured plan and restoration by M. Deglane, one of the most talented and distinguished of the younger generation of French archæological architects, originally published in the *Moniteur des Architectes*. They are given here in order to illustrate Professor Aitchison's Royal Academy lectures on Roman Architecture.

They are specially referred to in the fifth lecture, which will be published in our next, when we will give some further plans in illustration of the subject.

## ON SOME TYPICAL GREEK BUILDINGS.*

I am glad to believe that an increasing number of English architectural students are showing their interest in Greek work by visiting the country and examining the remains of the buildings in their original place, and I only hope that this paper may have some influence in increasing this number. I am sure that any one who does so will gain very valuable lessons, even though he may never care, or have the opportunity, to erect a modern building in either of the Greek styles. There never has been a period since the time, some two centuries ago, when the Parthenon still stood practically complete, when a visit to Greece would so well repay the architectural student. Archæological societies,—Greek, French, German,—have, with infinite care and pains, and at great expense, laid open buildings for decades, if not centuries, buried and unknown, and full of instructive points; and equally important excavations have been carried on by Dr. Schliemann in his private capacity.

It may not be out of place here to say that Athens cannot be considered now an out-of-the-way place to get at. There are several routes; the one I myself prefer is *viâ* Marseilles, and by this route travelling expenses out and back need not amount to more than 20*l.*, nor the time occupied in travel exceed about eleven days. Athens, itself and alone, is well worth a visit, though, of course, when once there, it seems desirable if possible to see at least two or three of the other sites; and any student going out properly accredited will find every facility put in his way for pursuing his studies both by the Greek archæological officials and by the Directors of the English and American Schools. Any one acquainted with German will receive equal consideration from the Director of the German School, who has no equal in the practical acquaintance with the buildings themselves, except Mr. Penrose.

It seemed to me, in selecting a subject for this paper, that it would be better to take a few characteristic buildings, and examine them in detail and with some care, rather than to visit hurriedly a large number of sites.

I propose to refer briefly to three buildings which we may take as representing the domestic, secular, and sacred architecture of the Greeks, viz.,—the Palace at Tiryns, the Propylæa, and the Erectheion of the Athenian Acropolis. The last of these is also a wonderfully beautiful example of the use of the Ionic order, while the second illustrates the very best period of the Doric order, and all three are specimens of the magnificence and freedom of Greek planning. And I may, perhaps, confess that the possibility of adequately illustrating them to you, either by means of photographs or diagrams, had its influence upon the selection of these buildings for our purpose. At the same time, I shall not scruple to show you a few photographs of other buildings, which may assist us to understand them more completely.

Of the three buildings which we are to consider, by far the oldest is the Palace at Tiryns, though six years ago its existence was unknown, and, by most people at least, undreamt of. It is, perhaps, therefore suitable that we should consider it in the first place, more especially as we shall discover in it the beginnings of much of the later Greek art and architecture.

The citadel of Tiryns occupies a magnificent position near the sea, overlooking the Bay of Nauplia. The rock rises abruptly out of the level plain, and nowhere is there any eminence that, in the days before artillery was introduced, could command it. The natural features of the rock were seized upon by the Greeks, and form the key to its fortifications, which were adapted to it with great skill; they are said to be the most massive of their kind in Greece, and possess several points of great interest. But we must not linger over them, and I can only refer any student who wishes a more detailed account of the walls or the palace to Dr. Dorpfeld's account of them contained in chap. v. of Dr. Schliemann's "Tiryns."

Suffice it to say that, owing to the form of the rock, three more or less separate forts existed within the outer ramparts,—the lower, the middle, and the highest,—and that crowning the last, and occupying the greater part of it, stood the king's palace. The materials used in its construction were stone,—limestone, breccia, and sandstone,—clay, either beaten hard or used as mortar or cement, or as sun-dried bricks; lime, and wood; while in the decoration of its surface, plaster covered with coloured decoration, carved alabaster, and almost certainly bronze plates, were employed. The plan of this fortress-palace, though not perfectly preserved, approaches being so, and is far less incomplete than the palaces at Mycenæ or Troy, or the fragments of Erectheus's palace on the Athenian Acropolis, and all three have many points of similarity both in plan and construction.

At Tiryns, having passed through the fortress-wall, not an easy matter in the old days for any but a friend, we approach the outer gate of the palace. This gives admittance to a large open space, devoid of building. After traversing this we reach the outer or great Propylæum, with an outer and an inner portico, the forerunner in every essential particular of the great Propylæa at Athens, and of many others. Each portico takes the form of a distyle in antis, while the wall of the gate is pierced by a single opening in the centre, whose great folding-doors stood, not between the jambs, but inside them, and their bronze-covered pivots worked in circular holes cut in the stone of the threshold, which was much wider than the wall. From the inner portico a door admits the visitor to a long winding passage leading to the women's apartments, and just beyond the portico a short passage gives a side entrance to the court of the men's apartments. This Propylæum gives direct admission to a large outer court of irregular form; the buildings enclosing it to the south and west have been either largely obliterated by later buildings, or slipped down the hill with the line of fortification, which gave way here. On the north side they are more perfect, and it is possible to trace distinctly the line of the small Propylæum giving access to the court of the men's apartments. This gateway was similar to the great Propylæum, having an outer and inner portico, and the gate-wall was provided with folding-doors. The court-yard to which this gave admission was large, about 65 ft. by 50 ft., clear of the porticoes which surrounded it on three sides, the east, south, and west; this court was paved, and so also was the outer one already referred to, with concrete and laid so as to clear itself of water. Nearly in the centre of the south side was placed the great altar of Zeus, which is on the axial line of the vestibule which occupied the greater part of the north side of the court. The front of this vestibule took the form of a temple in antis, and was raised on two steps, forming a stylobate. The bases of the two columns and of the antæ remain; these below the ground level are of irregular form, but above it they are carefully squared to the line of the wall. This also is the usual treatment of the thresholds here, but at Mycenæ they are squared throughout. The bases of the antæ have their tops rebated and drilled with a series of holes for wooden dowels. In general the base stones at Tiryns are from 18 in. to 2 ft. high. The upper part of the antæ was formed of timber beams placed in juxtaposition side by side, and dowelled to the base, and probably to each other; and these would carry the ends of the lintels, probably formed in a similar way of more than one piece, as was the case later with the great stone architraves of the Parthenon and other temples. The side walls of this vestibule were decorated with slabs of alabaster, richly carved and inlaid with glass. Three pairs of doors hung folding between the jambs gave access to an ante-chamber, from which an opening, not, however, provided with a door, led to the megaron, or principal men's apartment, which was over 30 ft. wide and nearly 40 ft. deep. In the centre are the bases for four wooden pillars which helped to carry the roof, and between them are traces of the large circular clay hearth, found in much greater perfection in Mycenæ; the floor of the hall was of concrete, ornamented with a rectangular pattern in incised lines. Of course any restoration of elevations or sections is somewhat uncertain. The walls in the upper parts were of perishable materials — wood and sun-dried bricks—and these fell an easy prey to the fire which destroyed the Temple. The roof was almost certainly flat, and made of clay on a layer of rushes, and the room may have been lighted either by openings in the walls or by having a portion of the roof raised as a simple clearstory or central lantern. From the ante-chamber access is also obtained to the bath-room, which could also be reached from the men's court. The floor of this room was formed by one single stone, sunk and polished and drilled with dowel-holes for a wood lining to the room, and was provided with a movable terra-cotta bath and with a drain; this bath adjoins a long and winding corridor, out of which several rooms, whose exact purpose it is difficult to determine, opened. It also led to the staircase to the middle fortress, and eventually to the women's apartments, and may have been intended for the use of servants or slaves.

The women's apartments, in general arrangement, closely copy the men's, but they are smaller, and the two sets have no direct communication. The long passage from the inner portico of the great Propylæum gives access through a stoa on its west side to an open court; this communicated directly with the inner court of the women, which had stoæ on its east, and on part of its north side. The rest of the north side was occupied with the vestibule to the women's hall, and with the entrance to the corridor which ran round them. This court was drained into the channel from the bath, already referred to, which was formed of rectangular terra-cotta channel pipes which fitted into each other.

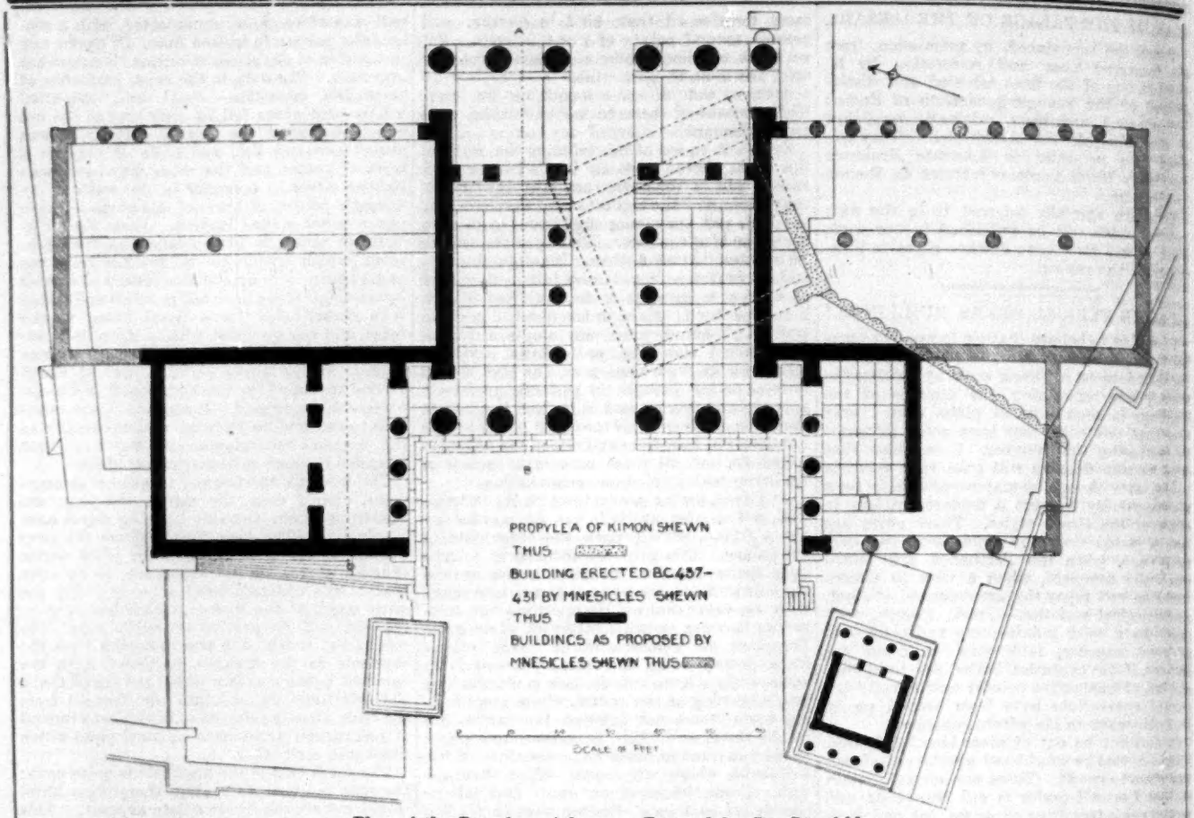
The south side of the vestibule is quite open; the span is about 18 ft., and therefore a lintel would not require intermediate support. This vestibule is nearly square; east and west doors lead into the surrounding corridor, and on the north side a single door, about 5 ft. 3 in. wide, leads to the women's hall; this door is of special interest, for in the pivot-hole the great bronze pivot was actually found. In the centre of the hall there seems to have been a square hearth. East of this hall are several well-defined rooms, grouped together, and only accessible from the surrounding corridor; they probably comprised the King and Queen's sleeping-chamber, with a vestibule, while a small passage gives access to inner rooms, which formed the treasury and armoury; south of this passage is probably the position of the staircase leading to the roof.

A few other rooms are accessible directly from the women's outer court; their exact purport cannot be at all definitely fixed, but the most important rooms of the palace have been passed in review, and there is but little question as to their identification.

To refer to a few general particulars as to construction, &c., the walls of these rooms stand, for a height mostly of from 1 ft. 6 in. to 3 ft., the lower portions being constructed of stone; above this height the walls seem to have been constructed of timber and sun-dried bricks, and were usually from 2 ft. 6 in. to 4 ft. 6 in. thick. Both the upper and lower parts of the walls, external as well as internal, were coated with clay and then lime plaster; the latter was painted in various colours, subjects being introduced as well as geometrical patterns. The antæ, as we have seen, had usually solid stone bases, the upper parts being formed of massive timbers forming an end to the wall. It is probable that these timbers, and also the wooden columns of the porticoes and the megaron, were encased with bronze plates; fragments of such plates belonging to a column were found at Mycenæ, and it is supposed that the interior of the vast chamber known as the Treasury of Atreus was extensively, if not entirely, lined with a similar skin of bronze.

The thresholds were, with one or two exceptions, of stone, of irregular form, but all, excepting a broad central band, which was carefully worked to the width of the wall and stood slightly above the finished floor-level, was worked down so as to allow the floor to be carried up to the wall-line evenly throughout. The roofs were probably flat, formed of massive timbers, which carried, as already stated, reeds, and above them clay; this forms a heavy but good roof if well looked after during the wet season, and is still in general use throughout the East. There may have been an upper story

*From a paper by Mr. R. Elsey Smith, A.R.I.B.A., read before the Architectural Association on the 14th inst., as elsewhere mentioned.


PROPYLEA OF KIMON SHEWN THUS
BUILDING ERECTED BC 437-431 BY MNESICLES SHEWN THUS
BUILDINGS AS PROPOSED BY MNESICLES SHEWN THUS
SCALE OF FEET

*Plan of the Propylæa, Athens, as Restored by Dr. Dörpfeld.*

over a good portion of it; at any rate, it is probable that there would be at least summer sleeping apartments.

This is one of the earliest Greek buildings of which we have any extensive remains, and belongs, probably, to the sixth century B.C., or possibly an earlier date even. It was certainly finally destroyed in the early part of the fifth century, but the Mycenæ palace, which is of later rather than earlier construction, certainly cannot be later than the eighth century. We have thus a not incomplete idea of a palace of an early Greek king, and are able, in conjunction with the discoveries in the Mycenæ tombs, to form some idea of the splendour of their homes. They were essentially warriors, and probably there was little in the way of what we should consider luxury in their manner of living, but their fortresses and palaces were magnificently constructed, and the latter richly adorned, and their armour and weapons and utensils were often of precious material and most delicate and graceful workmanship.

But, apart from the interest that attaches to whatever may help us to realise the life of the old Greek heroes, of whom we have all heard or read, this palace possesses a very genuine architectural interest, for in it we find evidence of the origin of much that we shall encounter in our study of the later marble architecture; and here already the difficulties of a trabeated system of architecture have been encountered and overcome. In the megaron of the men, for instance, we have an arrangement almost exactly repeated in the cpisthodomus of the Parthenon. Here, too, we perceive the constructional *raison d'être* of the anta, which was repeated in the early stone and marble architecture, but which ceased to have any real purpose, other than an artistic one, in those buildings which were entirely constructed of marble, and where this feature becomes purely ornamental. We detect, also, the fondness of the Greeks for colonnades or porticoes, a necessity, indeed, of the climate. The system of decorating walls with bronze plates may suggest an origin for the great friezes of later days. We notice, too, great facility in adapting the plan to the limits of the site and to its special requirements, and the importance they attached to a magnificent and stately approach to an important building.

If we endeavour for a moment to realise the effect produced on a visitor to the Palace in all its glory we cannot imagine it to have been otherwise than a striking and grand one, for which the plan seems eminently adapted. The angle at which the great Propylæum is set to the little one would bring the latter at once into view in passing through the entrance-door; it would, moreover, produce a pleasing variety in shade effects, a point which the Greeks seem to have studied with the utmost care, and notably so in the arrangement of the buildings on the Athenian Acropolis. The outer court itself was probably in some way shaped up, ragged as its outline now appears; and the small Propylæum led on thence to the Court, with its colonnades casting deep and welcome shadows, and through the pillars of the vestibule and the triple doors of the ante-room to the dimly-lit megaron itself. The whole was rich with colour, alabaster, and bronze, and probably further beautified with splendid textiles. The women's apartments would produce somewhat the same effect on a smaller scale. Of the proportions in elevation it is not safe to speak, but, at any rate, the important rooms, as far as planning is concerned, seem well considered and grouped, and at least to approach nearly to the simple relative proportions so markedly employed later.

No better example of their delight in lavish expenditure of thought and labour over the erection of an imposing portal can be brought forward than the Propylæa at Athens, yet this is but an elaboration of the principle contained in the Propylæum at Tiryns, carried out on a magnificent scale and with the very finest materials and workmanship.

The word Propylæa means simply "before the gateways," and signifies the colonnade of the entrance either to a sacred precinct, or, as in the case under consideration, to a fortress or some other enclosure. Other examples may be found at Eleusis, Ægina, Epidauros, &c., but none equalled in magnificence that at Athens.

The older gateway of Kimon, of which remains exist, was on a more modest scale, and was partly built of limestone faced with marble slabs or stucco, and with marble antæ, and probably columns. The present building was commenced the year following that in which the Parthenon was dedicated, when mechanical skill and mathematical science had reached the utmost perfection, and was planned on a truly magnificent scale. The entire scheme was never carried out; what the true cause of its being abandoned may have been is not quite certain, and does not greatly matter to us, but the Peloponnesian War brought work to a final standstill in 431 B.C., and at this time no portion of the building was finished, and much of it not commenced, or up to foundation level only.

The line of the wall of marble which contains the actual gateways is approximately north and south, and to the west and east were two great hexastyle porticoes; the western one is very deep, and is flanked on either hand by less important porticoes with buildings behind. Somewhat similar but more extensive buildings were designed to flank the eastern portico, but were never carried out, though traces showing the starting and position of them remain. The site presented great difficulties—it was irregular, uneven, and with a very rapid fall to the west; but so skilfully were the very difficulties turned to account, and so admirably does the building fit its site, that they may readily be overlooked; and the whole design is so natural and straightforward that the effect produced on the mind seems to be, that it could hardly have been treated differently.

I have given a brief outline of the original scheme, which will be readily understood from the plan.* I wish now to describe briefly the portions coloured black, those that were actually erected, and which still remain more or less complete. They comprise, briefly, the wall of the gateways; the east and west porticoes, both imperfect, the north-west wing, complete, except for the roof, and a small part of the south-west wing.

A magnificent flight of steps, flanking the approach for chariots, must have led up from the entrance below the temple of Nike to the level of the western or outer portico, which stands on a stylobate of four steps; but this approach no longer exists, and the steps now in situ are quite modern. The Doric portico, with a wide intercolumniation in the centre, was surmounted by a pediment, while the two lines of slender Ionic columns behind each supported an immense architrave in a single block, extending the full depth of the portico; the beam is partially hollowed out, to reduce its weight. The wall containing the gates, and which stood on a lofty stylobate of five steps, is pierced by five openings, which were originally filled with

* The diagram from which our illustration is taken was enlarged from the small plan by Dr. Dörpfeld in the Mittheilungen of the German Archæological Institute at Athens, Vol. X., 1885. The plan of those portions of the building actually existing was corrected from Mr. Penrose's plan in his "Principles of Athenian Architecture," and in a few details from dimensions taken by Mr. R. Elsey Smith.

trance doors: the central one (the largest) would be used by the Panathenaic procession, the two smallest side-doors being of comparatively small dimensions. The side walls of this portico undoubtedly had low seats running their whole length, and this would form a magnificent and convenient place of meeting and discussion. The eastern, or inner, portico had a similar elevation to the western, but the columns were raised on a continuous square plinth or stylobate.

The north-west chamber is fairly complete: its west wall stands on an earlier foundation in a different line, and to this the new work has been very cleverly adapted. This chamber is entirely enclosed by walls, the southern one being pierced with openings for a door and two windows, and having a portico of three columns further to the south. It is worthy of remark that the doorway does not come centrally with an intercolumniation. The columns of this portico were also of the Doric order, but on a very much smaller scale than those of the great porticoes. The roof to this wing was hipped, and, as usual, flat in pitch.

The opposite wing to this was never completed, but there is sufficient to show that the original design of this wing, while balancing the other in its total mass, differed widely in its plan, and no doubt in its uses. You will see, from a glance at the plan, that the portico here which exists, is similar in elevation to the opposite one, but is much deeper; and that the chamber, instead of being enclosed, and approached by a door, is open on its west side to another portico, whose columns occupy the line of the west wall of the corresponding wing. I wish to avoid touching on anything that may be considered merely of archæological rather than of architectural interest, but I think it may be well to briefly refer to the reasons for the restoration of the original plan of this wing, which most certainly was never completed, and this will render necessary an allusion to an earlier epoch in the history of Greek architecture: but for this purpose we need not leave the present building, but merely consider the Propylæa of Kimon.

As was the case with many of the Greek buildings erected later than very archaic times, when marble was hardly used, but previous to the magnificent epoch of Pericles, when lavish expenditure was made, and marble used exclusively for the finest work, this earlier Propylæa was constructed partly of fine limestone and partly of marble. The walls were constructed of the former, but they were terminated, at least when they were in a line with a range of marble shafts, with blocks of marble forming the well-known antæ. These projected beyond the line of the wall, so as to stop the marble or plaster casing which was applied to the rougher material, and the width of the anta was proportioned to the diameter of the column in connection with which it stood. We have seen instances at Tiryns of a still earlier treatment in wood, but very similar in purpose.

When buildings were entirely constructed of marble, the feature was copied in it, just as in earlier days we find the features of timber construction copied in stone, and observe the way in which it was adapted to various positions. Where it forms the termination to a wall in line with a range of columns, it has a broad face and narrow sides. But where it terminates a wall at right angles to a line of columns we have two broad faces and one narrow one. Bearing this in mind, let us examine the remains we have of the south-west wing, and see what they teach us. I should remark here that the pier occupying the angle between the north and west porticoes is not now *in situ*, but was until a few years ago. The blocks of which it was composed are close at hand. The plan of this pier clearly seems to point to the fact of its having formed an angle pier between two porticoes, for we find a broad face to come next a column, another broad face forming the termination of a wall, and with a narrow return, and then after a very short bit of wall we have another anta, very clearly pointing to a line of columns running in a direction at right angles to the first portico. If we use now an intercolumniation identical with the north portico, in our attempt to construct the west one, the second column comes, as it should do, exactly opposite the anta of the existing wall, and with four columns in all, this allows of an angle pier at the south-west angle similar to the one from which we set out. As this west portico was never built, a makeshift had to be adopted, and the small pier, of an entirely irregular and unusual form, was introduced to carry the architrave running from the end of the existing wall to the westernmost column of the existing portico, but in an irregular line.

I have dwelt at some length on this point firstly because it seems to me not unimportant to feel tolerably certain of any restoration that may be attempted of this building, which, without doubt, was second only to the Parthenon in beauty and in reputation amongst the Greeks; and secondly,—and this is to us of even more importance perhaps,—because it seems to me to be an instance of the care and thought that should be devoted to any building, whether Greek or Roman or Gothic, that it may fall to the lot of any one of us to restore, either on paper or in actual practice. As regards myself, I can only say that I cannot recall any single lecture or paper that I have heard or read that impressed me more and gave me a clearer idea of the method to be pursued in the examination of existing architectural buildings, and the importance of not disregarding the least bit of evidence, however apparently trivial, than the lecture I heard Dr. Dörpfeld deliver on the subject of the Propylæa on the spot, where he could point out each point as he referred to it. To that lecture I am largely indebted for a great part of any knowledge I possess of the building. The general surface of the walls seems to have been left unfinished, though this was not the case with the columns, and I may refer again to it when the lantern slides are thrown upon the screen, as also to the method of working the drums of the columns, which I recollect Mr. Penrose explaining here some years ago, and which I hope to be able to show you. The full-size mouldings shown on the walls were taken by my friend, Mr. Schultz, during the year I was in Athens. They strike one rather, I think, as being small in character and especially small in projection; were they executed in a coarse material and placed under the dull skies and smoky atmosphere of London they would, probably, not be very effective, but in the pure air of Greece the sun casts shadows as sharp and clear as possible, and every line tells, and the delicate material allows of very delicate treatment.

The Doric order, drawn to a small scale, is sometimes apt to look excessively severe, and possibly uninteresting. The same may, perhaps, be said of various reproductions of it in stone. It is, however, a different matter when you see it executed in marble, with perfectly true and sharp lines, and, as a result, perfectly true and delicate shadows. Even as a ruin the Propylæa produces an almost inconceivable effect of grandeur and magnificence. Turning round from under the Nike bastion one comes full upon it from below, and one can realise the object of the deep portico on the west side, for nearly the whole of its richly-decorated soffite, when it still existed, would have appeared at once to an old Greek visiting it; while the great pediment of the central portico would have towered above the hipped roofs of the wings. The break in the roof-level, which on a section seems unsightly, would from no point have been visible, except at such a distance as to be unobjectionable. One can nowadays sit down near the commencement of the steps under the shade of the bastion, and watch the sun, as it creeps round gradually, bring out new lines of light, and cast fresh shadows and deepen existing ones; and when all this took place, with the gloomy depths of the great portico and its gorgeous roof for a background, it must have been, indeed, a sight for gods and men.

Finally, we will make a short inspection of the Erectheion, and though it is not from many points of view the most typical temple to have selected, it is a very interesting example of the variety and beauty that may be introduced into a Greek religious building, and further, it is a beautiful example of the Ionic order. Another reason which, I think, alone would justify me in its selection, is that when you have obtained some idea of the plan and elevations of the building, any of you who care to do so may examine for yourselves, and within a mile of this room, almost every detail of it. In the British Museum, between the Parthenon marbles and the new Phigaleian room, a great many fragments are collected together—an entire column, including cap and base, from the east portico,—the only column missing from the exterior of the building,—large portions of the architrave and cornice, and various smaller details. One or two fragments from the Propylæa, including a cap,—badly placed, however,—and the drum of a column and part of an architrave, may be seen in the same room.

Mr. J. Fergusson read a paper on this building before the Royal Institute of British Architects on February 14, 1876, but he confined his attention principally to the elucidation of the difficulties in connexion with the arrangement of the interior. I dare say many of you know the paper; it is very learned, and seems to have proved his point, but I wish only just to refer to this interior which is destroyed, to show its effect on the existing exterior. It was divided internally, says Mr. Fergusson,—whose restoration has been, I believe, generally accepted,—by a cross wall into two distinct temples; the eastern one at the higher level was dedicated to Erectheus, and the western, much lower, to Athene Polias, and this latter was the most sacred shrine on the whole Acropolis.

This arrangement naturally affects the exterior very largely. The position chosen for its erection is just at the point where the Acropolis rock commences to fall away rapidly. At the east end we find a hexastyle portico standing on a stylobate of three steps, with its architrave in position, and it would be complete but for the removal of the north-east column to the British Museum. Portions of the frieze of black marble also exist. The south wall remains throughout its whole length, but not to its full height. The stylobate and the base moulding of the antæ are continued; and, as usual, the first course of stone is very much deeper than any of the others. At the west end of this wall is situated the Caryatid portico, with six female figures, and these, though at a glance almost identical, reveal a great variety in their treatment as regards detail; to this point a uniform level has been maintained, but this portico is founded on the stylobate of a large early temple, and below it there is a sudden drop to the ground-level. The west façade had a blank wall for nearly half its height, with a plain central doorway; above this, the wall had attached columns, and was pierced with windows.

The north wall extends far enough beyond the west wall to obtain a doorway in it entirely outside the building, giving access to a court lying to the west of the building, and entered from the great north portico; beside it is the principal doorway. This tetrastyle portico has six columns in all, and still retains part of its coffered ceiling; its floor level corresponds to that of the western doorway. The north wall is complete as regards its length, and at some point an external flight of steps between the building and the Acropolis wall must have led up to the higher level.

Sadly ruined as this building is, we are enabled to obtain a very fair idea of its general effect; from whatever point of view it is seen there is a charming variety of grouping and outline, and it is hardly possible to find a view in which at least two of the porticoes are not visible. Added to the beauty of outline, the delicate mouldings and the exquisite carving, which though employed with no niggard hand is concentrated on certain points, must have given the complete building an air of wonderful delicacy and refinement, and this was no doubt heightened by an extensive use of colour.

We have now considered more or less briefly each of the three buildings I proposed to describe to you. In the first case we had to confine our attention mainly to the plan and observe its clever grouping and variety of line, with the early promise of future development. The other two examples belong to the very best period of Greek art, and as regards style no more perfect examples of the Doric and Ionic orders are to be found, and it is interesting to contrast the two. In each case the materials and workmanship are the same, that is to say, literally the most perfect that it is possible to obtain. The Propylæa owes its impressiveness and dignity, which even in its present ruined state is undeniable, to the most careful grouping of the various parts, and its comparative massiveness, combined with the most accurate and carefully considered proportions of the relative parts and very delicate optical refinements. It is absolutely devoid of carving or sculpture, and there is no trace of such ever having existed; carving indeed was sparingly used in the Doric order, but sculpture was often used in a lavish way, as at the Parthenon; it was almost invariably set in some frame, such as the pediment or metope, and skilfully designed so that the main lines of

the grouping should give a contrast to the enclosing lines. In the Ionic order as typified by the Erectheion we find sculpture comparatively unimportant, though a sculptured frieze is by no means unusual; the carving of long lines of surfaces is, however, adopted; this is no doubt more suited to the slenderer proportion and more delicate effect of the composition. Before closing I should like to try and show you something of the effect produced by these buildings as they stand. Though for architectural purposes, including those of instruction, photography may be, in many ways, inferior to a good set of drawings, I believe no other means is so capable of conveying the effect of a building and its workmanship, even to a trained architect, as a good photograph, thrown on to a large screen, with the aid of a lantern. (Nearly thirty views were then shown on the screen and explained by the lecturer.)

[We must defer our report of the discussion until next week.]

## FREE LECTURES TO ARTISANS AT CARPENTERS' HALL:

### MR. BANISTER FLETCHER ON "THE ARCHITECTURE OF THE WORLD IN ALL AGES."

The first of this year's series of free lectures to artisans and others on matters connected with building, under the auspices of the Worshipful Company of Carpenters, was delivered on Wednesday, the 5th inst., by Mr. Banister Fletcher, J.P., F.R.I.B.A., Master of the Company, as already briefly mentioned. Sir John Lubbock, F.R.S., presided, and there was a large attendance.

Mr. Banister Fletcher, in his introductory remarks, referred to the necessity for art-training, and quoted a remark made by Mr. T. G. Jackson, M.A., at the Art-Congress at Liverpool in 1888, "that architects should train public taste." Asking the question, "What is Architecture?" the lecturer answered it by giving the following short definition:—"Architecture is the art of constructing buildings upon scientific principles with proportion and beauty." After quoting the late Mr. E. M. Barry's definition of architecture,—"a useful art as well as a fine art,"—the lecturer proceeded to trace the history of the human habitation from the earliest times, quoting from Viollet-le-Duc and Gwilt, and pointing to enlarged copies of illustrations from the works of those writers in elucidation of his remarks. He next treated of the rock-cut cave dwellings and temples of India and Asia Minor. Passing on, he briefly and rapidly referred to the varied and characteristic forms of Egyptian, Assyrian, Hindu, Chinese, and Mexican architecture, and then described the main features of Greek and Roman architecture. Next came a description of Saracenic architecture, with its developments in Syria, Persia, India, Turkey, and Spain. The lecturer then briefly treated of Romanesque, Gothic, and Renaissance work, and concluded by alluding to modern revivals. This is but an outline of the lecture, which covered so very wide a field, and necessarily extended to such length, that we cannot print it *in extenso*, having regard to the many other claims on our space just now. We give, however, the lecturer's concluding remarks: "In dealing with this vast subject to-night, I have treated it more as a short and concise history, from a superficial point of view, rather than as an architectural history dealing with the details; for it is too vast and great a subject to be so dealt with in a single lecture. But I have endeavoured to place before you the very many different types of architecture, showing how they each arose, and the reason for the fresh forms. I would again remind you that each type was the outcome of some distinct impulse. We have had in this country during this century a great impulse. I refer to steam and electricity. Compare the result of their introduction on shipbuilding with the result of their operation on architecture. In shipping they have created a new style: in architecture they have done practically *nil*. We have, it is true, large viaducts and lofty buildings, large hotels and termini, but there is no peculiar style. We meet to-day with Gothic, Greek, Moorish, &c. Surely there must be some reason for these incongruities? I think you will agree with me, it is due not only to a want of artistic feeling on the part of the people, but also to the great competition of the age, in which all join in striving to turn in as great a result as possible out of the least outlay of intellect or money. Much has of late years been done by city companies and kindred institutions to educate the people, and to endeavour to create an artistic feeling, but much remains for us to do. As an illustration of what has been accomplished in a minor department, I would mention stage scenery. Compare it with that of thirty years ago, and the great improvement will be at once seen. Managers, ever quick to suit the taste of the public, have realised the necessity. In conclusion, I hope that this evening has been a pleasant one,—that the time spent among the glorious works of the past has given us elevating thoughts, an earnest desire to cultivate our taste, a longing for and power to appreciate the beautiful and good, and determined us, as far as in us lies, to make our buildings more architecturesque and our homes more artistic."

## PROFESSOR ROGER SMITH ON DRAWING: GEOMETRICAL AND PERSPECTIVE.

The second lecture of the series was delivered on Wednesday, the 12th inst., by Prof. T. Roger Smith, F.R.I.B.A., who observed at the outset that drawing was becoming more and more one of the "matters relating to building." Every difficult piece of construction was worked out on paper. Our contracts were arranged, our estimates were made on the basis of plans and drawings, and these were consulted every hour during the progress of any important building; while the deposit of plans of sites, drains, and buildings, which modern laws and by-laws so often rendered necessary, had made it requisite to prepare copies, in duplicate or triplicate, of plans of almost every building, even the smallest. This was the case far more now than it was when the lecturer first began to become familiar with building matters, and very far more than it could possibly have been a century back; while, before the use of paper had superseded parchment, or even before the time when paper was obtainable in large sheets, drawings were a rare luxury. No one could do much building work who could not read a drawing with facility, while no one could hope to rise to any position of responsibility in connexion with buildings who could not make a tolerable drawing of anything that he had to deal with. Even those the nature of whose work made it unlikely that they would be called upon to make drawings, would do well to learn to draw, in order that they might be able to understand and make use of working drawings. The phrase which he had just made use of, viz., "reading drawings," was constantly employed to explain the power of understanding drawings, and was very significant. To one man a drawing conveyed information, just as a book in a language he understood would do; to another man a drawing was as much a puzzle as a book in a language which he had not learnt; and the man who could not understand the drawings for a building was unavoidably shut out from much important employment in connection with it, for which he might in other respects be quite fitted. Now, there was no way of learning to read surer than learning to write,—no way of learning to read drawings surer than learning to make them. That alone ought to give draughtsmanship great importance to the members of an audience like the present. The subject naturally split itself into two divisions, and he had attempted to mark them by the use of the two words, Geometrical and Perspective, in the title. Geometrical drawing represented things as they were, and not as we saw them. Perspective drawing represented things as they appeared to the eye, and not as they were. That sounded like a paradox, but it was the simple truth, and the paradox, if there was one, rested upon the singular circumstance that our sight, from which we derived almost all our notions of solid things, rarely, if ever, let us see them as they were, but almost always modified or distorted them in a manner which they would recognise the moment it is pointed out to them. On this head the lecturer continued:—Go into a great building with an open roof,—say, for example, Westminster Hall,—and look up at the trusses of the roof. You see them all,—one beyond another,—or, at any rate, you see a portion of each past those nearer to you, and each one as you look up at it appears below the one on this side of it, and smaller. The trusses appear to be diminished and lowered by distance, and in drawing such an interior in perspective, the draughtsman would put in each truss lower and smaller as it recedes from the eye. In real truth, however, as has just been said, the trusses are equal in size and all on a level, and were the draughtsman showing the interior of Westminster Hall on a geometrical drawing, he would draw the trusses all of a size and all at the same level (in such a drawing as, for example, a longitudinal section). Take a geometrical elevation of St. Paul's Cathedral, and look at the relative positions of the great west portico and the dome. The geometrical elevation will show you what is the fact: that the dome is exactly behind the portico, so that a line which divides the portico into two halves, and cuts through the apex of the pediment, if produced, would divide the dome into two halves. Go to the building itself, and you will find that though when you are exactly opposite the two features are in the same relation to one another, the moment you move to the right the dome appears to move to the right also, and the apex, or point of the pediment, begins at once to move towards the left of the dome, so that a person taking a view of the cathedral from a point where the front and flank are both visible—for example, from the south-west angle of the churchyard—must represent it with this pediment towards the left and the dome towards the right. Perspective drawings, then, mean drawings of objects as the eyes see them, including, if you will, other things than buildings, though to buildings we shall chiefly confine our attention. Geometrical drawings mean drawings which represent the actual shapes and arrangement of things, but represent them as we never exactly see them, but only as we know them to be—just in the same way as a map represents a country, a town, or an estate—not as we see it from some neighbouring eminence, but mapped out to scale. The foundation of all geometrical drawing is the use of a scale and the power of measurement.

We regret that we have not space to give the whole of the lecture, but we quote the concluding portion of it:—

Perspective drawing may be made one of the most difficult and perplexing subjects, and it figures as such a subject in most books. I strongly advise those who wish to learn it to get personal instruction, and that over a drawing-board. You may probably find instruction in a class, where the teacher is practical, which will answer the purpose; but the best method is, after a very little study of the principles, to begin a drawing under the guidance of some one who is familiar with this sort of work. You will find it quite as difficult to learn perspective drawing by a book alone as to learn in the same manner to ride on horseback, or to play at cricket. It was stated early in the lecture that perspective has to do with other things besides buildings with straight walls and roofs. See a line of soldiers, straight, well set up, and perfectly in line. They look like a wall, and if you drew them you would draw them like a wall. Let the word be given to fall out, and the wall dissolves, but the men of whom it is composed, though they have dissolved into irregular groups, are just as much influenced by the laws of perspective as before, and their apparent size is just as much diminished if they are at the remote part of the parade ground as it was when they were at the remote end of a formal line. In drawing or painting the human figure, and in other artistic work, what is called foreshortening, which is one of the sources of artistic effect, is very much practised. This is perspective. Represent a man with his arm stretched out across the picture like a sign-post, and you have a bold figure not very difficult to draw; but let him swing his arm round and point right at the spectator, or nearly at him, and you tax the resources of the most skilful draughtsman to render correctly on paper the effect which this attitude produces on the spectator. Foreshortening, or in other words the perspective of the human figure, needs much practice to manage it well. Another use of the word perspective is to be found in the mouths of those who discuss paintings, especially landscapes. I refer to aërial perspective, for which phrase might be substituted "effects of atmosphere." Here is no longer any question of outline, but of those sobering effects, due to the distance of an object, which rob its outlines of sharpness, its colouring of contrast, which hide much of its detail, and harmonise and blend together things that would be distinct and separate were the object nearer to the spectator. This is not, properly speaking, an effect of perspective at all, but it is an effect of distance, and it seems to have acquired a name which gives it some claim to mention

when perspective is being considered. In taking leave of the subject, I wish to come back from any reference to the painter, or even the perspective draughtsman, to the sort of drawing which is more immediately the concern of most of us. I strongly recommend any who do not draw to make an attempt to learn. It is like acquiring a new language. After you have been practising drawing for a time, every drawing that comes into your hands has a new meaning for you, just as when you have done exercises in a foreign language for a time you begin to find that books in that language cease to be impenetrable mysteries to you, and find a voice with which to address you. When you get further, and are able to make good, useful drawings of intended works, you begin to feel like the man who has mastered a foreign tongue sufficiently to be able to speak in it; and it is not alone the sense of a new power which is desirable, valuable though that may be, but that power makes you a more useful man, and a more valuable man on a building, in whatever capacity you may be engaged, and will give you more certainty of employment and better prospects of good pay. Only let me urge on those who learn to draw to fix it in their minds that they must draw *well*. Your work, whether simple or otherwise, should be clear, vigorous, distinct, free from blunders, executed with a clean line, true to scale, and, in short, good in quality.

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The third of this series of lectures was delivered at the Carpenters' Hall on Wednesday evening last, by Professor W. H. Corfield, M.A., M.D., his subject being "Modern Sanitation." Mr. Joseph Preston presided, and there was again a very large attendance.

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## THE LONDON COUNTY COUNCIL.

THE usual weekly meeting of this Council was held on Tuesday last, in the Council Chamber of the Corporation of London, Guildhall. Sir John Lubbock, the Vice-Chairman, presided, in the absence of Lord Rosebery.

*The Architect's Department.*—The first part of the Standing Committee's Report on this department was then considered. This part of the Report was as follows:—

"We have to report that we have just concluded an inquiry into the staff and the general arrangements of the Architect's department, an inquiry which was rendered necessary by various circumstances, but particularly by the taking away from that department the work of valuation, and the constitution of a separate office of Valuer. The arrangements to be made have been carefully considered by a Sub-Committee appointed by us for the purpose, and their suggestions have been thoroughly reconsidered by us. Our first recommendation is:—

(1.) That the two departments be named respectively the Architect's Department and the Estates and Valuation Department.

*Estates and Valuation Department.*

The principal duties of this department will be the following:—

Prepare plans and estimates of cost of improvement schemes, and support such schemes before Parliamentary Committees.

Assist in the preparation of Parliamentary plans, when required.

Survey and prepare plans in detail of land and buildings to be purchased.

Value for compensation, and conduct negotiations for purchase, and give evidence.

Advise on the value of local improvements on applications for loans or contributions.

Value for reserve rents and prices for surplus property.

Advise on the assessments for rating of property belonging to the Council, and (with the assistance of the Solicitor when necessary) conduct all objections and appeals against assessments.

Examine the valuation-lists of the several parishes as prepared under the Valuation (Metropolis) Act, and support objections with a view of promoting such uniformity of practice amongst Assessment Committees as will secure a fair basis of contribution to Metropolitan rates between one parish and another.

Value Government property with reference to the contributions made in lieu of rates in respect of such property.

Keep a register of the Council's property.

Manage the property taken for improvements, but not collect the rents.

Superintend the execution by the general works contractors of repairs and general works incidental to such property.

Deal with the Council's lands and buildings, valuing, plotting, letting, sales by auction, or otherwise.

Report periodically to the Corporate Property Committee, the Improvements Committee, the Local Government and Taxation Committee, and to any other Committee as required.

We recommend,—

(2.) That the foregoing be approved as a general outline of the duties of the new department, it being understood that the full duties comprise such as are required by any of the Committees associated with the department and approval of the Council.

In connexion with the interest of the Council in the proper working of the Valuation (Metropolis) Act, we have ascertained that a large percentage of the forms of return sent out by the local authorities are not returned, and, although in some parishes such non-return is taken as ground for increasing an assessment, this course is not generally approved. We believe that one excuse for many returns not being made would be removed, and the business generally expedited, if the return forms were allowed to pass through the post free, and, as the valuations made are made solely at the expense of the local rates, although used for imperial as well as local taxation purposes, we recommend,—

(3.) That her Majesty's Government be requested to allow the returns to be sent to the local authorities through the post free.

The Staff of the Estates and Valuation Department would be as follows:—

Principal Officer: The Valuer—Mr. A. Young. Salary, 1,000*l.* a year.

Chief Professional Assistant: The Assistant Valuer. Duties—To assist the Valuer in professional work as required, and in his absence to undertake his duties and responsibilities. Mr. E. J. Harper, service eleven years. Present salary, £280 a year.

We recommend—

(4.) That Mr. Harper be appointed Assistant Valuer, at 350*l.* a year.

Chief Clerk: Duties—To control clerical work of the department; examine accounts, prepare reports, indices, &c., conduct correspondence, and be generally responsible for the indoor work of the department. Mr. W. Garnsey, who has been seventeen years in the service, and is now in receipt of £300 a year, the maximum of his class.

We recommend—

(5.) That Mr. Garnsey be appointed chief clerk at a salary of 350*l.* a year.

First Class Officer: Mr. F. W. Cook.—Salary, 187*l.* 10*s.* Service, eleven years.

We recommend—

(6.) That Mr. Cook be placed in the first class, at the commencing salary of the class, 200*l.* per annum.

Six Second-Class Officers.—Mr. A. Maddox, inspector of tenement property. Attends to changes of tenancy, valuation of fixtures, notices to quit, &c. He has been in the service eleven years, and is a very useful and experienced man. Present salary £3 per week.

We recommend—

(7.) That Mr. Maddox be placed at the top of the second-class at 200*l.* a year.

Messrs. F. J. Ruddle, H. Ainsworth, W. A. Webb, and F. Littlewood, are surveyors who have entered the service during the past two years. They have proved themselves good officers, and have been paid 3*l.* 3*s.* per week.

We recommend—

(8.) That Messrs. Ruddle, Ainsworth, W. A. Webb, and Littlewood, be placed in the second-class at the commencing salary of 162*l.* 10*s.* each.

There is a vacancy for an additional land surveyor, whose employment was authorised by the Council on August 2 last, but who has not yet been appointed owing to want of accommodation."

These recommendations were all agreed to, although amendments were moved to the effect that the Valuation work proper (the valuation of property which the Council might seek to acquire) should be kept distinct from the management of the Council's estates, another officer appointed for the last-named work. It was also urged that the salary proposed to be given to the Valuer was inadequate.

*Green-street, Leicester-square.*—On the recommendation of the Improvements Committee, it was resolved, after a long discussion,

"That the consent of the Council be given to the acquisition by the Vestry of St. Martin-in-the-Fields of the land now vacant in Green-street, including the site of the corner house, called No. 31, Leicester-square (the demolition of which is only awaiting the decision of the Council), for the purpose of adding to the public way so much thereof as may be arranged by the Council, and that the Council do, upon the usual conditions and subject to an estimate being submitted to the Council by the Finance Committee, as required by the statute, contribute three-fourths of the cost, after deducting the recoupment; and that the Solicitor be instructed to prepare an agreement with the Vestry for carrying the arrangement into effect."

After transacting other business, the Council adjourned.

## ARCHITECTURAL SOCIETIES.

*The Architectural Association.*—The ordinary fortnightly meeting of this Association was held on Friday, the 14th inst., Mr. Leonard Stokes, President, in the chair. The minutes of the previous meeting having been read and confirmed, Mr. E. S. Gale (Hon. Secretary) announced that the second sessional visit would take place this Saturday, February 22, to the Imperial Institute, South Kensington, when Mr. Colicutt had kindly volunteered to meet the party. Mr. Gale also proposed a vote of thanks to the various gentlemen who facilitated their visit to Mr. D'Oyly Carte's new theatre, in Cambridge-circus, on the 8th inst., specially mentioning Mr. D'Oyly Carte, Mr. T. E. Colicutt, and Mr. Holloway and his assistants. Mr. F. R. Farrow (Hon. Secretary) announced that he had received an appeal from the secretary of the committee for the restoration of the tower of the Church of St. Mary Magdalene, Chewton Mendip, Somerset, which it is proposed to restore under the supervision of Mr. J. D. Sedding as architect. Mr. R. Elsey Smith then read a paper on "Some Typical Greek Buildings," the greater part of which we print in other columns.

*Liverpool Architectural Society.*—On Monday evening a special meeting of this society was held in the Royal Institution, Colquitt-street, Mr. T. M. Reade presiding. The principal item of the proceedings was a paper by Mr. H. L. Beckwith, F.S.I., on "Quantity Surveying." Speaking of the importance of quantity surveying as compared with the position it had held some years ago, he said it had now come to be a recognised profession by itself, especially in London. In these days of competition, speed was of very great importance, and it was most important that the quantities should be so described that the contractor, in running through the items, should have no difficulty in at once assigning the proper value to them.

*Manchester Architectural Association.*—At the ordinary meeting, held at the Diocesan Building on Tuesday last, Mr. J. H. Woodhouse, President, in the chair, Mr. F. R. Farrow, A.R.I.B.A., read a paper on "The Ventilation of Public Buildings," which he treated in a most exhaustive manner. A vote of thanks, proposed by Mr. Mould, seconded by Mr. Booth, and supported by Messrs. Hodgson, Stelfox, Hinde, and Willoughby, terminated the meeting.

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## CAST-IRON COLUMNS.

SIR,—Will one of your readers kindly tell me how "in practice" the dimensions of a hollow cast-iron pillar are calculated, "without the use of tables," the height and load being given.

The formula $W = 42 \cdot \frac{d^{3\cdot5} - d'^{3\cdot5}}{l^{1\cdot6}}$ seems only adapted to checking estimated dimensions, and then a table of logarithms is necessary.

GREENWELL.

*** "Greenwell" is referred to the four articles upon "Pillars" which formed our Student's Column ("Iron") in June, 1888. The formula he quotes is described in article xxv., page 454. In Stoney's standard book, as well as in other works upon the Theory of Stresses in Girders, &c., the powers of diameters ($d^{3\cdot5}$) from 1 to 12, increasing by fractional parts, and also the powers of length ($l^{1\cdot6}$) from 1 to 24 units of length, will be found.

Rankine's formula for the strength of struts and pillars is thus expressed $P = \frac{F}{1 + kL^2}$ in which reference to the above Tables of Powers is not involved. In this formula, which is constructed similar to the well-known Gordon formula: P = crippling strain in tons per square inch of section, F = the ultimate crushing strain of a short length of material in tons per square inch = 35 for cast-iron, $k$ = coefficient and for cast-iron = ·0025 or $\frac{1}{400}$ for circular section, and $L$ = length of column divided by the radius of gyration, so that for a solid circular cast-iron section

$$P = \frac{F}{1 + \left(\frac{1}{400}\right)\left(\frac{L}{r}\right)^2}$$

and since $r$, the radius of gyration, = the moment of inertia divided by the mass, if $a$ = the total area, we have

$$a\,r^2 = I, \text{ so that the formula may be written}$$

$$\frac{P}{F} = \frac{1}{1 + \left(\frac{1}{400}\right)\frac{a\,L^2}{I}}$$

This form is useful to apply when the moment of inertia of the section is calculated.

In the case of a solid circular section the moment

of inertia = ·7854 R⁴, and the area = ·7854 D², hence the radius of gyration

$$= \sqrt{\frac{R^4}{4R^2}} = \frac{R}{2} \text{ or } \frac{D}{4}$$

The formula is an empirical one, but by its means we may thus estimate the proportion of sectional area that a long column must have in proportion to a very short column which has been experimented upon, and which would fail by crushing, independent of flexure. Practical knowledge and experience can alone suggest the most exact diameter to employ, but since there is a liability for the core not to be concentric in casting, there is no harm in erring upon the safe side in large columns. The hollow column of average thickness is preferable to a smaller one of greater thickness, and the latter is also preferable to a solid column, because by enlarging the diameter, increased stiffness is attained with the same quantity of metal. In the case of a hollow column the strength nearly equals the difference between that of two solid columns the diameters of which are equal respectively to the external and internal diameters of the hollow one.

Suppose, for example, we imagine we have to deal with a column 12 in. solid diameter and 80 in. long. If five tons may be allowed as the safe strain in a very short column, how much may be allowed for this column with both ends firmly fixed and bedded with extreme care?

$$r = \frac{12}{4} = 3 \text{ inches.}$$

$$P = \frac{5}{1 + \left(\frac{1}{400}\right)\left(\frac{80}{3}\right)^2} = \frac{5}{1 + \frac{6400}{3600}} = 1{\cdot}8 \text{ tons}$$

per square inch, and since $\frac{5}{1{\cdot}8} = 2{\cdot}78$, it shows that the area required would be at least twice that of a short column where five tons permissible strain could be introduced.

## IMPACT LOAD.

Sir,—A rectangular slab of concrete is firmly supported at two opposite sides in the direction of its length, and held firmly as between two girders, while the adjacent opposite edges in the direction of its width are free and unsupported. A weight of ¼ cwt., or 56 lb., is allowed to fall upon the centre of the slab, from a height of 9 ft., and it is required o know what *dead* load, applied passively, would beequivalentto the impulsive load described above.

Can any of your readers give the writer any suggestion on the subject? Impact.

## AIR CURRENTS IN SEWERS.

Sir,—Referring to the article which appeared in your paper some weeks ago on Mr. W. Santo Crimp's experiments on the movement of air in sewers, I have recently taken observations in the deep headings and completed sewers in the outfall works at Margate, with the result that I find the direction of the air currents is controlled entirely by the wind on the surface. J. Wilkinson.

Phœnix Wharf, Battersea, S.W.

# The Student's Column.

## ELECTRICITY, MAGNETISM, AND ELECTRICITY SUPPLY.—VIII.

### MAGNETIC TERMS.

IRON and steel play such important parts in the construction of dynamo-electric machinery and other plant used in connexion with electricity supply, that it is necessary, before proceeding further, to define certain terms used in describing the magnetic state and properties of magnetic substances. Until quite recently, magnetism has been very superficially treated in ordinary text-books; anything like an exact study of the subject has been by purely mathematical methods, that is to say, by methods which put certain abstract facts into symbols in such a way that the investigator entirely loses sight of their physical aspect. For mathematical purposes, magnetism is frequently considered to be a fluid capable of acting at a distance, an assumption known to be contrary to the truth, while the all-important lines of force are ignored. Now, however, that magnetism has, owing to the dynamo-machine, become an important factor in modern engineering, entirely new methods of dealing with problems connected with it are being developed. The subject being, then, in a somewhat transitional state, in the explanations of the various expressions which follow the customary definitions are first given, but an endeavour is made to translate explanations involving the idea of a fluid into language involving the idea of lines of force, the probable nature of which has already been discussed.

The definition of unit magnetic pole was given in a previous article. By this definition, it is a pole which produces a field of unit strength at a distance of one centimetre from it; but the locus of points distant one centimetre from a pole is a spherical surface, whose area is $4\pi$ square centimetres, hence from a point of unit strength spring $4\pi$ lines of force, since there is one line per square centimetre of surface. The poles of a magnet, or solenoid carrying a current, are but centres of force at which the whole of the magnetism may be supposed concentrated, magnetism being then regarded as the agent which produces lines of force; in just the same way the whole of the quantity of matter in a body is frequently supposed concentrated at its centre of gravity. It is, therefore, sometimes convenient to speak of "a quantity of magnetism," and *Unit quantity of Magnetism*, as that quantity which produces $4\pi$ lines of force. If it is desired to measure the quantity of light coming from a gas flame, the total quantity or number of rays of light sent out in all directions is measured; a lens may make the amount of light emitted in one direction vastly greater than that sent in another, but it does not change the total quantity of light given by the flame. Similarly the lines of force springing from a magnet may be concentrated in one direction, so as to form a very intense field, or may be distorted in any way; but a given quantity of magnetism can only produce a given number of groups of $4\pi$ lines of force.

*The Moment of a Magnet* (M) is the strength of one of its poles ($m$) multiplied by the distance ($l$) between them. That is $M = m\,l$. The expression "magnetic density" is sometimes applied to the surface of a magnet. *The Magnetic Density* (D) at any point on the surface of a magnetised mass is the quantity of magnetism per square centimetre at that point,—that is, D is the number of groups of $4\pi$ lines that emerge per square centimetre at that point.

The degree to which a body or portion of a body becomes magnetised is called its "intensity of magnetisation."

*The Intensity of Magnetisation* (I) at any point within a magnetised body is the magnetic moment per unit volume at that point. Let $v$ be the volume of a little cube of cross section $s$ cut from around the point so that an edge is parallel to lines of force, then if M be its moment, $I = \frac{M}{v} = \frac{m\,l}{s\,l} = \frac{m}{s}$. Now from the quantity of magnetism $m$ there come $4\pi m$ lines of force, therefore I is the number of groups of $4\pi$ lines passing through the point per square centimetre. In the case of a uniformly magnetised bar, I is the number of groups of $4\pi$ lines emerging from the magnet divided by the area of the end or cross section.

The various definitions given so far do not involve in any way considerations of the magnetising agent; indeed, in the case of a permanent magnet no such agent exists, for having once become magnetised coercive force keeps the molecules in position. Steel and iron are magnetised by various methods, but they all consist of sending lines of force through the metal by some means or other so as to turn the molecules along them in the desired direction. In the case of steel, and even to a certain extent in the case of soft iron, a blow or continued vibration appears to temporarily loosen the molecules and enables them to turn more readily; just as when examining the shape of a magnetic field by means of filings a tap on the card or surface on which they are placed makes them lie in greater numbers along the lines of force. A piece of soft iron is usually magnetised by placing it within a helix, the whole forming an electro-magnet as soon as the current passes; steel may be magnetised in the same way, or by putting it in front of an electro-magnet. In the two definitions which follow the inducing field may be regarded as that produced by a helix, its strength H being the strength of field within the helix when filled with air only.

When different substances are placed in a magnetic field of a certain strength the intensity of magnetisation induced differs considerably, and depends on the "susceptibility" or "co-efficient of magnetisation" of the substance in each case.

*Susceptibility* ($k$) / *Co-efficient of Magnetisation.* } Is the intensity of magnetisation per strength of inducing field.

That is $k = \frac{I}{H}$. When the coil was empty H lines per square centimetre passed through it; the iron having been inserted it became magnetised to the intensity I, and, therefore, added $4\pi$ I lines of force per square centimetre. Hence k H is the quantity of magnetism produced in the metal by the field of strength H per square centimetre of cross section. Closely allied with the susceptibility is the "permeability," or "co-efficient, of magnetic induction."

*Permeability* ($\mu$) / *Co-efficient of magnetic induction* } is the ratio between the number of lines of force per square centimetre passing through the metal and the strength of the inducing field. The number of lines of force added per square centimetre has just been shown to be $4\pi$ I, so that the total number is $H + 4\pi I$, hence

$$\mu = \frac{H + 4\pi I}{H} = 1 + 4\pi k, \text{ and } k = \frac{\mu - 1}{4\pi}$$

The difference between *susceptibility* and *permeability* is roughly this: Susceptibility involves the idea of the metal adding magnetism to the system; permeability that of the metal multiplying the lines in the original field. Either can be calculated from the other by means of the above formulæ.

The reader may be reminded that we have adopted the theory that electricity is an incompressible continuous fluid permeating alike all matter and all space, filling it completely. Fluid is not exactly the right word to use, but as there is no right word, "fluid" is used as being the best to be had. Magnetism has been described as portions of this fluid rotating around axes, which form closed curves, threading their way through space and all sorts of materials. Magnetism is measured by the number of these axes or lines of force produced, and the quantity numerically stated by the total number of groups of $4\pi$ lines formed. The method of measuring magnetism must not be confused with that adopted for measuring the strength of a magnetic field, when the number of lines passing through a given area is taken and not the total number of lines in the field. Broadly speaking, then, by a quantity of magnetism we mean a quantity or a number of lines of force.

It is a remarkable fact that when one of these whirls or lines of force is sent into a piece of iron or other magnetic substance it produces a number of other whirls within the mass, which, in turn, are sent out of the substance. This power of multiplying or adding to lines of force, already respectively referred to as permeability and susceptibility, will be discussed more fully in future articles.

The value of $\mu$ for air or space is arbitrarily taken as 1. Substances for which the value of $\mu$ is greater than 1 are called *paramagnetic*, or simply *magnetic*; those for which $\mu$ is less than 1 are called *diamagnetic*.

## RECENT PATENTS.

### ABSTRACTS OF SPECIFICATIONS.

116, Cement and Plaster. R. Stone.

The chief point in the process of manufacture which is the subject of this patent consists in treating with petroleum, oil, vitriol, or spirit, the chalky substances of which the cement is composed. By this means the sulphur, an injurious compound in cement, is removed. Several modifications and different parts of mechanism for rolling and grinding the chalky material are incorporated in the same specification.

2,780 and 2,781, Artificial Stone. A. C. Ponton and others.

According to this invention an artificial stone is made by taking fine or coarse aggregates of a silicious nature,—sand, gravels, pebbles, &c.,—and mixing them with a silicious cement composed of silicate of soda or of potash, &c. After the materials are mixed together they are moulded in blocks and subjected to heat, and afterwards staked for use. The second specification relates to the mixing of the substances and the subsequent crystallisation by heat, and claims that artificial stone so prepared may be returned to the moulds without showing any shrinkage or distortion.

6,261, Chimney-pot. F. Meriton.

The chimney-cowl which is the subject of this patent is of octagon shape, and fitted with hanging flaps, which are blown by the wind in such a way as to prevent down-draught, those on the opposite side being open to allow for the escape of smoke.

10,759, Fire-places and Mantel-pieces, &c. E. C. Massey.

This invention is designed to provide open fire-places or grates with fittings of effective appearance and increased radiating power, and the improvements consist in forming upon steel or other metal designs, figures, and ornamentation of porcelain or pottery in flat, relief, or intaglio.

16,774, Carpenters' Pough and Fillister. H. Hadden.

This invention consists in the use of screws passing through the top of the plane into nuts to prevent the sliding bars from slipping when the tool is at work, and the rounding of the forefeet or guide of the plough to prevent jerk whilst ploughing over mortices.

NEW APPLICATIONS FOR PATENTS.

*Feb. 3.*—1,776, C. Phillips, Metal Dowels.—1,782, R. Ashworth and W. Evans, Self-acting Door-closer.—1,789, T. Thomas, Automatic Flushing Syphon.—1,795, W. Roff, Water-closet.—1,820, H. Gorney, Kiln for Burning Bricks and Tiles.

*Feb. 4.*—1,839, F. Schmidt, Fittings and Double Windows or Casements.—1,851, J. Stott, Joiner's Tool.—1,900, J. and A. Drexler, Roof Coverings.

*Feb. 5.*—1,908, R. Wilford, Screw-fastenings for Windows.—1,923, G. Dimmer, Chimney Cowl.—1,934, C. Fifield, Silicious Paving and Building Stone.

*Feb. 6.*—2,008, R. Evered and U. Coleman, Flushing Drains, Water-closets, &c.

*Feb. 7.*—2,020, J. Hatch, Roof Glazing.—2,021, S. and W. Dearden, Stone-sawing Machinery.—2,032, R. Carson, Adjusting and Holding Window-sashes in any desired vertical position.

*Feb. 8.*—2,077, E. Barlow, Water, Gas, Drain, and other Pipes, and Joints for same.—2,085, A. Hay, Fireproof Doors.

PROVISIONAL SPECIFICATIONS ACCEPTED.

14,177, J. Pring, Sliding and Reversible Casement Window.—20,528, E. Young, Preventing the Rattling and Shaking of Window-sashes.—20,681, A. Myall, Finishing Wood Mouldings.—20,692, J. Coulter, Machine for Dressing Stone, &c.—205, H. Johnson, Window Fasteners.—274, A. Natterer, Electric Bells.—423, W. Silverlock, Ventilating Sewers, &c.—428, A. Wright, Weathered Facing-brick.—711, W. Greaves, Ventilator.—734, W. and J. Rawlings, Syphon Flushing Apparatus for Water Closets.—777, F. Streeter, Water Waste Preventers.—802, J. Harding, Bakers' Ovens.—821, J. and J. Bruce and F. Baker, Shop-window Fittings.—832, G. Hope, Sand Separators.—1,185, C. Hunter, Extracting Cowl.—1,272, T. and H. Moorwood, Canopied Grates and Fire-places.—1,295, C. Shaw, Flushing Apparatus.—1,419, A. and E. Pullman, Fire-grates.

COMPLETE SPECIFICATIONS ACCEPTED.

*Open to Opposition for Two Months.*

4,422, W. Ingle, Hanging Sliding Window-sashes.—5,595, R. Roberts, Prevention of Down Draught in Chimney-pots.—5,644, T. Shouler, Fastenings for Cupboard-doors.—5,846, J. Watkinson and T. Dodd, Gas Brackets, &c.—5,900, H. Legg, Sash-locks.—13,118, A. Clark, Moulding-planes.—18,493, H. Lake, Bricks.—87, D. Hart, Screw-drivers.—257, L. Halliday, Saw-swages.—258, L. Halliday, Saw-sharpening Machines.—276, A. Boult, Sash-balances.

## RECENT SALES OF PROPERTY:

### ESTATE EXCHANGE REPORT.

FEB. 11.—By REYNOLDS & EASON.

Stamford-hill—13, 15, and 19, Vartry-rd., u.t. 68 yrs., g.r. £22. 1s., r. £98 p.a. ..... £775

Maida-hill—1, Bristol-mews, u.t. 60 yrs., g.r. £2 p.a. ..... 510

7, Bloomfield-mews, u.t. 52 yrs., g.r. £8, r. £22 p.a. ..... 110

By DEBENHAM, TEWSON, & CO.

Camberwell—62, Coldharbour-lane, u.t. 11 yrs., g.r. £16. 10s. p.a. ..... 100

By W. HOLCOMBE.

Hackney—37, Amherst-rd., f., r. £45 p.a. ..... 500

Paddington—4, Bloomfield-pl., u.t. 58 yrs., g.r. £3. 3s. p.a. ..... 290

FEB. 12.—By D. YOUNG.

Clapham—70, Studley-rd., u.t. 47 yrs., g.r. £6.... 380

Brixton—9, Canterbury-rd., u.t. 73 yrs., g.r. £7, r. £40 ..... 900

By ARBER, RUTTER, & WAGHORN.

Portland Estate—65, Bolsover-st., u.t. 29 yrs., g.r. £15, r. £130 ..... 840

FEB. 13.—By DENT & DALLAS.

King's Cross—F.g.r. of £312. 1s., with reversion in from 8½ to 23½ yrs. ..... 16,550

By W. T. MARSH.

Montagu-sq.—L.g.r. of £31. 10s., term 12 yrs..... 305

By NEWBON & HARDING.

Holloway—61, Eden-grove, f. ..... 500

82 and 84, Campbell-rd., u.t. 77 yrs., g.r. £10, r. £65 ..... 325

Islington—1 to 12, Chapel-pl., u.t. 22 yrs., g.r. £105 ..... 510

Holloway—4, Hornsey-rd., u.t. 68 yrs., g.r. £7, r. £38 ..... 270

Highbury—3, Hamilton-rd., u.t. 57 yrs., g.r. £7. 7s. ..... 290

By HARDS & BRADLEY.

Brockley—10, 11, and 12, Harcourt-rd., u.t. 84 yrs., g.r. £12. 10s., r. £76..... 735

(*Contractions used in these lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; yd. for yard, &c.)

## MEETINGS.

SATURDAY, FEBRUARY 22.

*Architectural Association.*—Visit to the Imperial Institute, South Kensington.

*Royal Institution.*—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "Electricity and Magnetism." II. 3 p.m.

*Provident Institution of Builders' Foremen and Clerks of Works.*—Annual Dinner, Holborn Restaurant. 6.30 p.m.

*Edinburgh Architectural Association.*—Visit to Parliament Hall and St. Margaret's Chapel.

MONDAY, FEBRUARY 24.

*Royal Academy.*—Mr. A. S. Murray on "Sculpture in Greek Temples." III. 8 p.m.

*Surveyors' Institution.*—(1) Mr. S. Woolf, Q.C., on "The Establishment of a Tribunal for the Trial of Compensation Cases." (2) Resumed discussion on Mr. G. M. Freeman's paper on "Some Suggested Amendments in the Law and Practice of Compensation." 8 p.m.

TUESDAY, FEBRUARY 25.

*Institution of Civil Engineers.*—Further discussion on the following papers:—(1) "The Shanghai Water-Works," by Mr. J. W. Hart. (2) "The Tytam Water-Works, Hong Kong," by Mr. J. Orange. (3) "The Construction of the Yokohama Water-Works," by Mr. J. H. T. Turner. 8 p.m.

*Sanitary Institute (Lectures for Sanitary Inspectors).*—Professor H. Robinson, on "Drainage and Construction." 8 p.m.

WEDNESDAY, FEBRUARY 26.

*Free Lectures to Artisans and others on Matters Connected with Building.*—Professor Armstrong on "The Domestic Fireplace," Carpenters' Hall, London-wall. 8 p.m.

*Institution of Civil Engineers.*—Students' Visit to the Nine Elms Works of the London and South-Western Railway. 2 p.m.

THURSDAY, FEBRUARY 27.

*Institution of Electrical Engineers.*—Discussion on the following papers:—(1) "The Theory of Armature Reaction in Dynamos and Motors," by Mr. J. Swinburne; (2) "Some Points in Dynamo and Motor Design," by Mr. W. B. Esson. 8 p.m.

*St. Paul's Ecclesiological Society.*—Major Heales, F.S.A., on "The Ecclesiology of Denmark." 7.30 p.m.

*Society of Arts (Indian Section).*—Mr. W. Sherriff on "The Northern Shan States and the Burma-China Railway." 5 p.m.

FRIDAY, FEBRUARY 28.

*Architectural Association.*—Mr. W. A. Pite on "Architecture in Oxfordshire." 7.30 p.m.

*Royal Academy.*—Professor J. H. Middleton on "Florentine Sculpture in the Fourteenth and Fifteenth Centuries." I. 8 p.m.

*Sanitary Institute (Lectures for Sanitary Inspectors).*—Sir Douglas Galton, F.R.S., on "Ventilation, Measurement of Cubic Space," &c. 8 p.m.

SATURDAY, MARCH 1.

*Association of Public Sanitary Inspectors.*—Mr. D. Richards on the "Disposal of House Refuse." 6 p.m.

*Royal Institution.*—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "Electricity and Magnetism." III. 3 p.m.

## Miscellanea.

**The Sanitary Assurance Association.**—The ninth annual meeting of the members of the Sanitary Assurance Association was held on Monday, the 17th inst., at the offices, No. 5, Argyll-place, W., Sir Joseph Fayrer, K.C.S.I., F.R.S., in the chair. Mr. Joseph Hadley, Secretary, read the annual report, which referred to the work of the Council in promoting the Sanitary Registration of Buildings Bill, to the lectures given by members of the Council on sanitary subjects, and special reference was made to the disclosure of serious sanitary defects in Board Schools and clergy-houses which had been inspected by the Association during the past year. The report concluded as follows:—"Though the important bearing of the work of the Association on the public health is not yet fully appreciated by the general public, the financial statement for the past year proves that the Association is making progress, and that after nine years' experience its work continues to be appreciated. The income for the year was 308*l.* 8s. 10d., and after meeting all liabilities a balance is carried forward." The Chairman proposed the adoption of the report, and said that the more he saw of the work of the Association and the need for sanitary improvement the more was he interested in its progress, and he expressed a hope that not only might this Association prosper but that others might be formed, so great was the work to be done. Alderman Sir Vincent Kennett-Barrington seconded the adoption of the report, which was supported by Surgeon-General Cornish, Mr. Mark H. Judge, and Mr. Henry Rutherford, and passed unanimously. General Burne, C.B., and Dr. Danford Thomas were re-elected members of the Executive Council, and Sir Joseph Fayrer and Professor T. Roger Smith, F.R.I.B.A., were re-elected President and Vice-President respectively.

**Schools, Leicester.**—In a limited competition, confined to local architects, we hear that the Newfoundland School Board have adopted the design of Mr. W. M. Cowdell, of Leicester, for a new school to accommodate 500 children.

**Mid-Kent Waterworks.**—There are new works being constructed by a company for the purpose of supplying Scotland and West Malling and several villages on the left or west bank of the Medway, between Maidstone and Rochester. The well, which was commenced in July last at Lower Halling, near Rochester, was dug to chalk-water level (12·00 ordnance datum), 50 ft. from the surface, then bored for 315 ft., making a total of 365 ft., at which depth, on Monday last, the 17th inst., water was tapped in the lower greensand. The geological formations passed through were, for the first 140 ft. chalk, then a thin layer of rock, through 220 ft. of gault, and 20 in. of very hard rock into the greensand, which is of a coarse nature. The yield is abundant, as immediately on being tapped it rose to within 37 ft. of the surface, or 15 ft. above chalk-water level, and is estimated to stand at a constant level, pumping over 20,000 gallons per hour. The bore-hole is lined with 15 in. wrought-iron tubes screwed together in wrought-iron sockets with a steel shoe, and then perforated tube with 5,290 holes ½ in. diameter in order to keep the sand from rising. The reservoir, to hold about 200,000 gallons, is built, and only has roof to be put on, and some eight miles of mains are laid. There are several large works, besides a population of about 8,000, to be supplied, and, at the request of the West Malling Rural Sanitary Authority, the Company is applying to Parliament this Session for an extension of area, especially on the right or east bank of the River Medway. Mr. Richard Batchelor, of Chatham, who has successfully made six out of the ten borings into the greensand in the county of Kent, was the contractor. Messrs. William Russ, M.Inst.C.E., and Arthur F. Bowker, C.E., F.R.G.S., are the engineers.

**The English Iron Trade.**—The better feeling in the English iron market which began last week has continued also during the present week, and the outlook would be hopeful if there were not the possibility that the threatened miners' strike may disorganise trade. Although the business done in pig-iron is still chiefly confined to holders of warrants, the fact that better prices have been obtained for them shows which way the tide is turning. The Glasgow warrant-market has been firmer, and there is also more demand for Scotch makers' iron. In the North of England, makers still hold to their former rates, while warrants have gone up 2s. a ton. In Lancashire producers sell very little crude iron, because their quoted prices are still nominally unchanged. In the midland district makers are little inclined to give way. In the north-west, hematite is firmly maintained by makers at its top price, because they are in no need of new orders. Manufactured iron is still quiet, but firmer in price. Steel also is very steady, because of a fair demand. Shipbuilders are booking very little fresh work, but they are fully engaged, and engineers also keep busy, notwithstanding a slight falling-off in the quantity of new work offering.—*Iron.*

**The Civil and Mechanical Engineers' Society.**—At a meeting of this society, held on the 19th inst. (Mr. Henry Adams in the chair), a paper was read by Mr. C. Fairlie Bruce, on "Italian Water Supply." The author briefly described the works at Turin, Milan, Verona, Florence, Leghorn, and Naples, dwelling at greater length on any points of interest involved in them—of these the subterranean service-reservoirs at Capodimonde seemed most striking—they are excavated at a depth of 164 ft. below the surface in the Tugea rock.

**Proposed French Exhibition at Earl's Court this Year.**—We are informed that at a meeting of the Réunion Commerciale and Industrielle, held at the Palais-Royal, Paris, on the 14th inst., M. Gustave Sandoz in the chair, it was unanimously decided to render every assistance in the organisation of the forthcoming French Exhibition, which opens at Earl's Court on May 3. It is stated that some of the most interesting of the attractions of last year's Universal Exhibition in Paris will be shown at Earl's Court.

**Architectural Partnership.**—Mr. J. F. Wadmore writes from 35, Great St. Helens to say that in consequence of the retirement of his partner, Mr. A. J. Baker (on account of ill-health), he has arranged to take his son, Mr. Beauchamp Wadmore, A.R.I.B.A., into partnership, in conjunction with Mr. W. B. Mallett, who has been with the firm for over twenty years. The title of the new firm will be "Wadmore, Wadmore, & Mallett."

**Supposed Coalfield in Kent.**—For the past two or three years Sir Edward Watkin, the Chairman of the South-Eastern Railway and Channel Tunnel Companies, has been directing his attention to a search for coal at a point on the South-Eastern Railway adjoining the experimental heading for the tunnel. The discovery of a bed of coal is now announced (in the *Times* of February 20) by Mr. Francis Brady, C.E., the engineer-in-chief of the South-Eastern and Channel Tunnel Companies, under whose directions the operations have been conducted. His report says:—

"Coal was reached on Saturday last, the 15th inst., at 1,180 ft. below the surface. It came up mixed with clay and reduced almost to powder by the boring tools. A small quantity of clean bright coal found in the clay was tested by burning, and proved to be of good bituminous character. The seam was struck after passing through 20 ft. of clays, grits, and blackish shales belonging to the coal measures, which at this point lie close under the lias, there being only a few intervening beds of sand, limestone, and black clay separating them. The correspondence of the deposits with those found in the Somersetshire coalfield is thus pretty close, the difference consisting in the absence of the red marl at the Shakespeare boring. The lines of bedding in the shale are distinctly horizontal. This is an indication that the coal measures will probably be found at a reasonable depth along the South-Eastern Railway to the westward. I beg to hand you herewith two specimens of the clay containing coal, one taken at 1,180 ft. and the other at 1,182 ft. I also enclose a specimen of clean coal taken to-day at 1,183 ft. 6 in. from the surface."

**Swimming-Baths, Southampton.**—The Corporation of Southampton have decided to erect covered swimming-baths, Turkish baths, and private baths for both sexes, and at their last meeting unanimously adopted the design and scheme as prepared by Mr. W. B. G. Bennett, C.E., the Borough Surveyor, the estimated cost being 7,000*l*. Tenders are to be asked for at once.

## PRICES CURRENT OF MATERIALS.

| | £. s. d. | £. s. d. |
|---|---|---|
| **TIMBER.** | | |
| Greenheart, B.G. ....ton | 7 0 0 | 7 15 0 |
| Teak, E.I. ....load | 12 0 0 | 14 0 0 |
| Sequoia, U.S. ....foot cube | 0 2 3 | 0 3 0 |
| Ash, Canada ....load | 3 0 0 | 4 5 0 |
| Birch ,, ....load | 2 0 0 | 4 15 0 |
| Elm ,, ....load | 3 10 0 | 4 15 0 |
| Fir, Dantsic, &c. ....load | 2 0 0 | 3 10 0 |
| Oak ,, ....load | 2 10 0 | 4 10 0 |
| Canada ....load | 5 10 0 | 7 0 0 |
| Pine, Canada red ....load | 2 10 0 | 3 10 0 |
| ,, yellow ....load | 3 0 0 | 5 5 0 |
| Lath, Dantsic ....fathom | 4 10 0 | 5 10 0 |
| St. Petersburg ....fathom | 5 0 0 | 6 10 0 |
| Wainscot, Riga, &c. ....log | 0 0 0 | 0 0 0 |
| Deals, Finland, 2nd and 1st. std. 100 ....load | 8 10 0 | 11 0 0 |
| ,, ,, 4th and 3rd ....load | 7 0 0 | 8 0 0 |
| Deals—Riga ....load | 7 0 0 | 9 0 0 |
| St. Petersburg, 1st yellow ....load | 11 0 0 | 14 0 0 |
| ,, 2nd ,, ....load | 9 0 0 | 10 10 0 |
| ,, white ....load | 6 10 0 | 10 0 0 |
| Swedish ....load | 7 10 0 | 16 0 0 |
| White Sea ....load | 9 0 0 | 17 0 0 |
| Canada, Pine, 1st ....load | 16 0 0 | 28 0 0 |
| ,, ,, 2nd ....load | 11 0 0 | 17 10 0 |
| ,, ,, 3rd, &c. ....load | 8 0 0 | 10 10 0 |
| ,, Spruce, 1st ....load | 9 0 0 | 11 0 0 |
| ,, ,, 3rd and 2nd ....load | 7 0 0 | 9 0 0 |
| New Brunswick, &c. ....load | 6 0 0 | 8 10 0 |
| Battens, all kinds ....load | 6 0 0 | 17 0 0 |
| Flooring Boards, sq., 1 in., prepared, First ....sq. | 0 11 0 | 0 14 0 |
| Second ....sq. | 0 8 0 | 0 10 6 |
| Other qualities ....sq. | 0 6 0 | 0 7 0 |
| Cedar, Cuba ....foot | 0 0 4 | 0 0 5 |
| Honduras, &c. ....foot | 0 0 4 | 0 0 4½ |
| Mahogany, Cuba ....foot | 0 0 5 | 0 0 6½ |
| St. Domingo, cargo average ....foot | 0 0 5 | 0 0 6½ |
| Mexican, cargo average ....foot | 0 0 4½ | 0 0 5½ |
| Tobasco ,, ....foot | 0 0 5½ | 0 0 6½ |
| Honduras ,, ....foot | 0 0 5½ | 0 0 6½ |
| Box, Turkey ....ton | 4 0 0 | 13 0 0 |
| Rose, Rio ....ton | 15 0 0 | 20 0 0 |
| Bahia ....ton | 14 0 0 | 18 0 0 |
| Satin, St. Domingo ....foot | 0 0 2 | 0 1 3 |
| Porto Rico ....foot | 0 0 10 | 0 1 6 |
| Walnut, Italian ....foot | 0 0 4½ | 0 0 6½ |
| **METALS.** | | |
| Iron—Bar, Welsh, in London ....ton | 0 0 0 | 0 0 0 |
| ,, at works in Wales ....ton | 0 0 0 | 0 0 0 |
| ,, Staffordshire, in London ....ton | 8 10 0 | 9 10 0 |
| Copper—British, cake and ingot ....ton | 53 10 0 | 55 0 0 |
| Best selected ....ton | 55 0 0 | 56 0 0 |
| Sheets, strong ....ton | 63 0 0 | 0 0 0 |
| Chili, bars ....ton | 48 0 0 | 0 0 0 |
| Yellow Metal ....lb. | 0 0 5½ | 0 0 6 |
| Lead—Pig, Spanish ....ton | 12 12 6 | 0 0 0 |
| English, com. brands ....ton | 0 0 0 | 0 0 0 |
| Sheet, English ....ton | 14 10 0 | 0 0 0 |
| Pipe ....ton | 15 15 0 | 0 0 0 |
| Tin—Straits ....ton | 91 5 0 | 0 0 0 |
| Australian ....ton | 91 5 0 | 0 0 0 |
| English Ingots ....cwt. | 0 0 0 | 0 0 0 |
| **OILS.** | £. s. d. | £. s. d. |
| Linseed ....ton | 22 0 0 | 22 5 0 |
| Cocoanut, Cochin ....ton | 26 0 0 | 0 0 0 |
| Ceylon ....ton | 23 10 0 | 0 0 0 |
| Palm, Lagos ....ton | 23 10 0 | 0 0 0 |
| Rapeseed, English pale ....ton | 35 0 0 | 35 10 0 |
| ,, brown ....ton | 33 10 0 | 34 0 0 |
| Cottonseed, refined ....ton | 22 5 0 | 0 0 0 |
| Tallow and Oleine ....ton | 21 0 0 | 40 0 0 |
| Lubricating, U.S. ....gall. | 5 10 0 | 6 10 0 |
| ,, refined ....gall. | 7 0 0 | 12 0 0 |
| Tar—Stockholm ....barrel | 1 6 0 | 0 0 0 |
| Archangel ....barrel | 0 17 6 | 0 0 0 |

# COMPETITION, CONTRACTS & PUBLIC APPOINTMENTS.

*Epitome of Advertisements in this Number.*

## COMPETITION.

| Nature of Work. | By whom Required. | Premium. | Designs to be delivered. | Page |
|---|---|---|---|---|
| Plan for School, Wood Green | Tottenham School Bd. | Not stated | Not stated. | ii. |

## CONTRACTS.

| Nature of Work or Materials. | By whom Required. | Architect, Surveyor, or Engineer. | Tenders to be delivered. | Page |
|---|---|---|---|---|
| Works and Materials | Hendon Local Board | S. S. Grimley | Feb. 24th | ii. |
| Works and Materials | Mortlake Highway Bd. | H. Richards | do. | ii. |
| Works and Materials | Willesden Local Board | O. Claude Robson | Feb. 25th | ii. |
| Transit Warehouse, &c. | Stockton-on-Tees Corp. | K. F. Campbell | do. | ii. |
| Roadmaking and Paving Works | Hammersmith Vestry | *Official* | Feb. 26th | ii. |
| Alterations and Additions to Engine-room | Hackney Union | W. Barnett | do. | viii. |
| Iron and Concrete Staircase at Workhouse | St. Pancras Guardians | A. & C. Harston | Feb. 27th | viii. |
| New Ward and Alterations to Mortuary | County of Chester | Stanhope Bull | do. | ii. |
| Iron Pipes and Castings for Waterworks | Calcutta Corporation | J. Quick & Son | Feb. 28th | viii. |
| Sluice Valves and Hydrants | do. | do. | do. | viii. |
| Engine House, &c. | Oxford Corporation | W. H. White | Mar. 1st | viii. |
| Superstructure of New Bankruptcy Offices | Com. of H.M. Works, &c. | *Official* | Mar. 3rd | ii. |
| Works of Drainage, &c. | Finchley Local Board | do. | do. | viii. |
| Enlarging Brick Sewer | Wimbledon Local Bd. | do. | Mar. 4th | viii. |
| Works and Materials | Tottenham Local Board | do. | do. | viii. |
| Kerbing, Tarpaving, Metalling, &c. | Lewisham Bd. of Works | do. | do. | viii. |
| Works and Materials | do. | do. | do. | viii. |
| Slopping and Watering, Dusting, &c. | St. Margaret (Westminster) Vestry | | do. | viii. |
| Reflux Valves, Stop Valves, &c. | Manchester Corp. | G. R. W. Wheeler | do. | viii. |
| Roadmaking and Paving Works | Fulham Vestry | G. H. Hill | Mar. 5th | ii. |
| Road Materials | Cranbrook R.S.A. | W. Sykes | do. | viii. |
| Married Couples' Quarters at Workhouse | Holborn Union | *Official* | do. | viii. |
| Cast-iron Columns, Wrt-iron Roof Principals | Ealing Local Board | H. Saxon Snell & Son | do. | viii. |
| Works and Materials | Bath U.S.A. | C. Jones | Mar. 6th | viii. |
| Painting and Repairs, Kennington-park | London County Council | C. R. Fortune | Mar. 8th | viii. |
| New Works at Parish Church, Ruardean | The Committee | *Official* | do. | viii. |
| Alterations and Additions to Schools | Wanstead School Board | Waller & Son | Mar. 10th | ii. |
| Enlargement of Post-Office, Birkenhead | Com. of H.M. Works | J. T. Bressey | Mar. 14th | viii. |
| Work, Materials, &c. | Bath U.S.A. | *Official* | do. | viii. |
| Buildings on Pier, Douglas, Isle of Man | Isle of Man Harb. Com. | C. R. Fortune | Mar. 15th | viii. |
| Making-up Roads | Beckenham Local Bd. | H. A. Cheers | do. | viii. |
| Painting and Repairs, Victoria-park | London County Council | G. B. Carlton | Mar. 17th | viii. |
| New Church, Romford | ... ... | *Official* | Mar. 24th | viii. |
| | | | Not stated. | xiii. |

## PUBLIC APPOINTMENTS.

| Nature of Appointment. | By whom Advertised. | Salary. | Applications to be in. | Page |
|---|---|---|---|---|
| Surveyor | Widnes Local Board | 250*l*. | Feb. 26th | xvi. |
| Nuisance Inspector | [Stockton-on-Tees Corp. | 120*l*. | Feb. 28th | xvi. |
| Surveyor | Burton-on-Trent Corp. | 400*l*. | Mar. 1st | xvi. |
| District Surveyors (4) of Main Roads | East Sussex C. C. | 160*l*. each | Mar. 3rd | xvi. |

## TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *noon on Thursdays.*]

BIRMINGHAM.—For erecting house, Westfield-road, Edgbaston, for Mr. H. Wright, Jun. Messrs. J. P. Sharp & Co., architects:—

| | |
|---|---|
| J. Harley & Son | £1,585 0 0 |
| George Gill | 1,580 0 0 |
| Gowing & Ingram | 1,571 0 0 |
| B. Whitehouse | 1,549 0 0 |
| John Goodman | 1,539 0 0 |
| John Webb | 1,489 0 0 |
| R. M. Hughes | 1,441 0 0 |
| F. Davis | 1,425 0 0 |
| E. Giles | 1,378 0 0 |
| F. J. Briley | 1,351 0 0 |
| Jones & Mason, St. May-street, Ladywood, Birmingham* | 1,345 0 0 |

*Accepted.

BROMLEY (Kent).—For erecting house for Mr. B. G. Gardiner. Messrs. Wadmore, Wadmore, & Mallett, architects, 35, Great St. Helens, E.C.:—

| | |
|---|---|
| Crossley, Bromley | £2,090 0 0 |
| Armand & Son, Bromley | 2,079 0 0 |
| Willshire, Sevenoaks | 2,070 0 0 |
| Jones, Tonbridge | 2,060 0 0 |
| D. Payne, Bromley | 1,985 0 0 |
| Grubb, Bromley | 1,978 0 0 |
| Holloway Bros., Battersea | 1,950 0 0 |
| Roome, Clapton | 1,893 0 0 |
| Holt & Son, Croydon | 1,850 0 0 |
| Allen & Son, Kilburn (accepted) | 1,838 0 0 |

BROMLEY (Kent).—For residence at Bromley, Kent, for the Rev. R. H. Lovell. Messrs. W. A. Williams & Hopton, architects, 156, Regent-street, W.:—

| | |
|---|---|
| Grubb | £1,675 0 0 |
| Ecsarat (accepted) | 1,473 0 0 |

BROMLEY (Kent).—For additions to residences, Widmore-road, Bromley, Kent, for Mr. H. Mitchell. Messrs. W. A. Williams & Hopton, architects, 156, Regent-street, W., and Bromley, Kent:—

| | |
|---|---|
| Lowe | £494 0 0 |
| Gregory | 420 0 0 |
| Roome (accepted) | 374 0 0 |

CATFORD.—For additions to Priory Cottage, Catford, for Mr. R. Archer. Mr. Albert L. Guy, architect, 78, High-street, Lewisham:—

| | |
|---|---|
| Laird | £144 0 0 |
| S. J. Jerrard | 121 0 0 |
| Robson, Lewisham (accepted) | 108 0 0 |

DAWLISH (Devon).—For building a dwelling-house, Brookdale-terrace, Dawlish, for Mr. J. Hearn. Mr. Geo. Soudon Bridgman, architect, Torquay:—

| | |
|---|---|
| J. Lamacraft, Dawlish | £852 5 0 |
| W. J. Hatcher, Dawlish (accepted) | 783 10 0 |

CHELSEA.—For the supply of York paving, for the Chelsea Vestry (annual contracts):—

| | |
|---|---|
| Nowell & Robson, Kensington | £745 16 6 |
| Turner & Son, Chelsea | 721 17 0 |
| A. & F. Manuelle, Leadenhall-street | 656 5 0 |
| W. H. Wheeler, 11, Queen Victoria-street* | 656 5 0 |

*For Granite Curb and Pitching.*

W. H. Wheeler ....Accepted at per schedule.

*For Broken Guernsey Granite.*

| | |
|---|---|
| Nowell & Robson | 14s. 4d. per yd. |
| Mowlem & Co. | 14s. 3d. ,, |
| W. Griffiths | 14s. 3d. ,, |
| A. & F. Manuelle | 14s. 1d. ,, |
| Fenning | 13s. 9d. ,, |

*Accepted.

DAWLISH (Devon).—For building new banking premises at Dawlish, for the Devon and Cornwall Banking Company. Mr. Geo. Soudon Bridgman, architect, Torquay. Fittings not included:—

| | |
|---|---|
| C. Stevens, Newton Abbot | £2,150 0 0 |
| J. Shapter, Dawlish | 2,100 0 0 |
| Hy. Stevens, Ashburton | 2,060 0 0 |
| W. J. Hatcher, Dawlish | 2,040 0 0 |
| F. A. Stacey, Newton Abbot | 1,800 0 0 |
| H. Webber, Paignton (accepted) | 1,665 0 0 |

DEVONPORT.—For the erection of Board schools in Morice Town, for the Devonport School Board. Mr. W. Curtis, architect. Quantities by Mr. T. Mullins, surveyor, Plymouth:—

| | |
|---|---|
| Tozer & Son | £4,040 0 0 |
| A. Sanders | 4,030 0 0 |
| Healy & Son* | 3,524 0 0 |
| J. Finch | 3,520 0 0 |
| Jenkin & Son* | 3,479 0 0 |
| S. Roberts | 3,403 0 0 |
| Lethbridge & Son | 3,326 0 0 |
| Lapthorn & Goad | 3,307 0 0 |
| Pethick Bros. | 3,140 0 0 |
| J. Reed | 3,006 0 0 |
| P. Blowey | 2,946 0 0 |
| A. R. Debnam | 2,565 0 0 |

[* These of Devonport. The others of Plymouth.]

HANWELL.—For reconstruction of drainage, &c., at Cuckoo-lane Schools, for the Managers of the Central London District Schools. Messrs. Henry Jarvis & Son, architects, 29, Trinity-square, Southwark, S.E.:—

| | |
|---|---|
| Walter Buckeridge (accepted) | £4,084 0 0 |

LONDON.—For alterations and additions to the "Well and Bucket," Bethnal-green-road, for Mr. E. E. Rose. Mr. J. C. Reynolds, architect:—

| | |
|---|---|
| Mills | £1,650 0 0 |
| Kaull | 1,593 0 0 |
| Staines | 1,495 0 0 |
| Cox | 1,390 0 0 |
| Todd | 1,334 0 0 |
| Whitehead & Co. (accepted) | 1,277 0 0 |

LEIGH (Essex).—For new schools, to accommodate 272 boys and girls, with residences for master and mistress, including boundary walls and fences, &c., at Leigh, near Southend-on-Sea, for the Leigh School Board. Mr. Walter J. Wood, architect, 1, Finsbury-circus, E.C. Quantities by Mr. Henry Bushell, 1, Finsbury-circus, E.C. :—

| | | | |
|---|---|---|---|
| H. Bridell, Greenwich | £5,400 | 0 | 0 |
| G. Dobson, Colchester | 5,240 | 0 | 0 |
| S. Mayes, Southend | 4,805 | 0 | 0 |
| Oliver & Richardson, Southgate | 4,796 | 0 | 0 |
| S. C. Farmenter, Braintree | 4,705 | 0 | 0 |
| J. Steward, Southend | 4,690 | 0 | 0 |
| F. E. Woodhams, Southend | 4,574 | 0 | 0 |
| J. Edmunds, Poplar | 4,547 | 0 | 0 |
| C. Orfeur, Colchester | 4,445 | 0 | 0 |
| Darke & Son, Southend* | 4,423 | 0 | 0 |

* Accepted after modifications.
[Architect's estimate, £4,600.]

LONDON.—For erecting new workhouse buildings, &c., at King's-road, Pancras-road, London, N.W., for the Guardians of the Poor of Saint Pancras Parish. Messrs. A. & C. Harston, architects, 15, Leadenhall-street, City. Quantities supplied by Messrs. Corderoy & Selby and Mr. W. T. Farthing :—

| | | | |
|---|---|---|---|
| Wall Bros. | £84,649 | 0 | 0 |
| Hallitoe, Bury St. Edmunds | 83,947 | 0 | 0 |
| Turner, Watford | 82,500 | 0 | 0 |
| W. Brass | 81,473 | 0 | 0 |
| Kirk & Knight | 81,250 | 0 | 0 |
| Fell, Leamington | 80,046 | 0 | 0 |
| Patrick, Chatham | 80,000 | 0 | 0 |
| W. Johnson | 79,500 | 0 | 0 |
| Allen, Kilburn | 76,842 | 0 | 0 |
| Flew & Co. | 76,265 | 0 | 0 |
| J. O. Richardson | 76,250 | 0 | 0 |
| Lawrence & Sons | 76,144 | 0 | 0 |
| A. & W. Pattinson | 75,458 | 0 | 0 |
| W. Buckeridge, Kensington | 75,240 | 0 | 0 |
| Kirk & Randall | 74,827 | 0 | 0 |
| A. Kraus, Bristol | 71,400 | 0 | 0 |

[Architects' estimate, £75,513.]

LONDON.—For rebuilding the "Red Lion" public house, Kilburn, for Messrs. Warman & Co., and for alterations and additions to the "Bon Marché," for Mr. W. Roper. Mr. W. T. Farthing, architect, 46, Strand, W.C. :—

| | Bon Marché. | | Red Lion. | | Total. |
|---|---|---|---|---|---|
| Wall Bros. | £4,297 | .. | £8,894 | .. | £13,191 |
| Burman | 4,177 | .. | 8,350 | .. | 12,527 |
| Leslie & Co. | 3,863 | .. | 8,653 | .. | 12,516 |
| B. L. Holloway | 3,900 | .. | 8,334 | .. | 12,324 |
| Scrivener | 3,800 | .. | 8,420 | .. | 12,310 |
| Godfrey | 3,814 | .. | 8,344 | .. | 12,158 |
| Shurmur | 3,798 | .. | 8,290 | .. | 12,088 |
| Baalam Bros. | 3,976 | .. | 8,083 | .. | 12,059 |
| Spencer & Co. | 3,684 | .. | 8,183 | .. | 11,867 |
| Oldrey & Co. | 3,767 | .. | 7,990 | .. | 11,757 |
| J. Allen | 3,777 | .. | 7,906 | .. | 11,683 |
| G. Todd | 3,690 | .. | 7,889 | .. | 11,579 |

LONDON.—For building the "The White Horse" Tavern, Shepherd's Bush, for Mr. W. G. Watts. Mr. W. G. Bartlett, architect, 2, New Broad-street, E.C. :—

| | | | |
|---|---|---|---|
| R. Eddle | £6,066 | 0 | 0 |
| F. & J. Wood | 4,819 | 0 | 0 |
| J. T. Chappell | 4,499 | 0 | 0 |
| Kirk & Randall | 4,436 | 0 | 0 |
| Patman & Fotheringham | 4,421 | 0 | 0 |
| Hearle & Son | 4,369 | 0 | 0 |
| Green | 4,363 | 0 | 0 |
| Oldrey & Co. | 4,357 | 0 | 0 |
| C. F. Kearley | 4,218 | 0 | 0 |
| Leslie & Co. | 4,093 | 0 | 0 |

LONDON.—For proposed alterations to the "Queen Elizabeth" public-house, Bagley's-lane, Fulham, S.W., for Messrs. Watney & Co., Limited. Mr. J. G. Ensor, architect. Quantities supplied by Messrs. Saville & Martin, 86, Strand, W.C. :—

| | | | |
|---|---|---|---|
| Prestige & Co. | £1,653 | 0 | 0 |
| Kynoch & Co. | 1,460 | 0 | 0 |
| Patman & Fotheringham | 1,396 | 0 | 0 |
| Oldrey & Co. | 1,334 | 0 | 0 |
| J. T. Chappell | 1,276 | 0 | 0 |
| Adamson & Sons | 1,268 | 0 | 0 |

[This list was received too late for insertion last week.]

LONDON.—For alterations, &c., at the "Chippenham" public-house, Shirland-road, Paddington, for Mr. W. Mills. Mr. C. Young, architect :—

| | | | |
|---|---|---|---|
| Colman | £2,770 | 0 | 0 |
| Langridge | 2,700 | 0 | 0 |
| Lascelles | 2,547 | 0 | 0 |
| Salt | 2,544 | 0 | 0 |
| Godfrey & Son | 2,490 | 0 | 0 |
| Mower | 2,447 | 0 | 0 |
| Godson | 2,337 | 0 | 0 |
| Higgs | 2,197 | 0 | 0 |

[This list was received too late for insertion last week.]

LONDON.—For paving, kerbing, and road-making for the Camberwell Vestry. Mr. J. C. Reynolds, Surveyor :—

*Landells-road, Dulwich.*

| | | | |
|---|---|---|---|
| Biggs | £1,452 | 15 | 4 |
| Gatty | 1,272 | 0 | 0 |
| Mowlem & Co. | 1,185 | 12 | 8 |
| J. Stowell, Camberwell | 1,139 | 19 | 4 |

*Teil-grove, Dulwich.*

| | | | |
|---|---|---|---|
| Biggs | £590 | 1 | 8 |
| Gatty | 493 | 10 | 0 |
| Mowlem & Co. | 468 | 9 | 7 |
| J. Stowell, Camberwell | 458 | 19 | 0 |

*Senate-street, Nunhead.*

| | | | |
|---|---|---|---|
| Biggs | £229 | 1 | 10 |
| Wheeler | 174 | 13 | 0 |
| Gatty | 167 | 0 | 5 |
| Mowlem & Co. | 163 | 12 | 9 |
| J. Stowell, Camberwell | 159 | 3 | 10 |

*Ferris-road.*

| | | | |
|---|---|---|---|
| Biggs | £568 | 18 | 4 |
| Wheeler | 379 | 15 | 0 |
| Gatty | 325 | 14 | 2 |
| J. Stowell | 304 | 17 | 6 |
| Mowlem & Co. | 281 | 16 | 8 |

LONDON.—For rebuilding the "Swiss Hotel," Old Compton-street, W., for Mr. C. Glattlie. Messrs. W. A. Williams & Hopton, architects, 156, Regent-street, W. Quantities by Mr. Wm. Mills :—

| | | | |
|---|---|---|---|
| Andes | £8,360 | 0 | 0 |
| Ryder | 5,421 | 0 | 0 |
| Lowe | 5,295 | 0 | 0 |
| Allen & Sons | 5,170 | 0 | 0 |
| Gregory | 5,100 | 0 | 0 |
| Roome (accepted) | 4,800 | 0 | 0 |

LONDON.—For alterations at the "Prince Albert," Notting-hill, W. Mr. Young, architect :—

| | | | |
|---|---|---|---|
| King | £1,720 | | |
| Ransell | 1,597 | | |
| Mower and Son | 1,490 | | |
| Colman | 1,440 | | |
| Goodall | 1,395 | | |
| Godfrey | 1,390 | | |
| Higgs | 1,377 | | |
| Salt | 1,323 | | |
| Godson | 1,167 | | |

LONDON.—For erecting shops, stables, &c., and executing various repairs, at Nos. 18 and 20, High-street, Camden Town, for Mr. J. Bryan. Mr. Robt. J. Beale, architect, Westminster :—

| | | | |
|---|---|---|---|
| S. R. Lamble, Kentish Town | £1,067 | 0 | 0 |
| Gould & Brand, Camden Town | 1,019 | 0 | 0 |
| G. Prior, Walthamstow (accepted) | 961 | 0 | 0 |

LONDON.—For alterations, &c., at 28, Wormwood-street, E.C., for Messrs. Horniman & Co. Mr. Albert Vicars, architect, 151, Strand :—

| | | | |
|---|---|---|---|
| Kiddle & Son | £980 | 0 | 0 |
| Todd | 978 | 0 | 0 |
| Oldrey & Co. | 948 | 0 | 0 |
| Ashby Bros. | 690 | 0 | 0 |

LONDON.—For alterations and additions to stables, &c., at "Rosedale," Walton-on-Thames, for Mr. F. Riddell. Mr. F. Le Rossignol, architect and surveyor. No quantities :—

| | | | |
|---|---|---|---|
| J. Langham | £969 | 0 | 0 |
| E. J. Ingram | 683 | 0 | 0 |
| H. Faulkner | 665 | 0 | 0 |
| B. Ingram & Co. (accepted) | 565 | 0 | 0 |

LONDON.—For part rebuilding Nos. 30, 31, and 32, Sandys-row, Middlesex-street, Whitechapel, E. Mr. J. O. Cook, architect. No quantities supplied :—

| | | | |
|---|---|---|---|
| Battley | £870 | 0 | 0 |
| Sharpe | 715 | 0 | 0 |
| J. O. Richardson, Peckham | 714 | 0 | 0 |

LONDON.—For alterations and additions to No. 16, King's-road, Chelsea, S.W., for Messrs. Lester & Co. Mr. J. William Stevens, architect, 21, New Bridge-street, London, E.C. :—

| | | | |
|---|---|---|---|
| Prestige & Co. | £495 | 0 | 0 |
| W. Buckeridge, Kensington | 465 | 0 | 0 |
| Peppiatt | 460 | 0 | 0 |
| Leslie | 456 | 0 | 0 |

LONDON.—For fittings, &c., to smoking-room, "Cyprus" Restaurant, Cheapside, E.C., for Mr. W. Kirkland. Mr. Walter Graves, Winchester House, E.C., architect :—

| | | | |
|---|---|---|---|
| Siegmann | £250 | 0 | 0 |
| Nightingale | 249 | 0 | 0 |
| Shaw | 247 | 0 | 0 |
| Sage & Co. (accepted) | 240 | 0 | 0 |

LONDON.—For pulling down the enclosure wall at the Chapel-of-Ease, Holloway, reconstructing same, and fixing an iron railing, for the Churchwardens of St. Mary, Islington. Mr. William Smith, architect, 65, Chancery-lane, W.C. :—

*Builders' Work.*

| | | | |
|---|---|---|---|
| Holton & Co. | £480 | 0 | 0 ! |
| Pattison | 471 | 15 | 0 |
| Potter & Sons | 465 | 5 | 0 |
| Philp & Son | 412 | 17 | 6 |
| Winton | 335 | 0 | 0 |
| Ruffell | 317 | 0 | 0 |
| Wilkinson Bros. | 295 | 0 | 0 |
| Jones & Co. | 295 | 10 | 0 |
| Hart | 281 | 5 | 0 |
| Bulford | 250 | 10 | 0 |
| Pigg & Co. | 240 | 0 | 0 |
| Brown | 220 | 0 | 0 ! |

*Ironfounders' Work.*

| | | | |
|---|---|---|---|
| Potter & Sons | 760 | 7 | 0 ! |
| Pattison | 515 | 0 | 0 |
| Burbidge | 448 | 16 | 0 |
| Bridgewater | 395 | 0 | 0 |
| Jones & Co. | 387 | 9 | 6 |
| Danaway | 362 | 12 | 0 |
| Hart | 357 | 7 | 0 |
| Hill & Smith | 354 | 19 | 0 |
| St. Pancras Iron Works | 345 | 0 | 0 |
| Pegg & Co. | 344 | 0 | 0 |
| Philp & Son | 318 | 12 | 6 |
| Chas. Smith & Sons | 245 | 0 | 0 ! |

[This list was received too late for insertion last week.]

LONDON.—For erecting shop and executing various repairs at No. 80, High-street, Camden-town, for Mr. R. C. Widdicombe. Mr. Robert J. Beale, architect, Westminster :—

| | | | |
|---|---|---|---|
| E. Toms, Camden-town | £339 | 0 | 0 |
| S. R. Lamble, Kentish-town | 332 | 0 | 0 |
| Gould & Brand, Camden-town* | 319 | 0 | 0 |

* Accepted.

LONDON.—For laying Limmer Asphalte in Ferris-road, from Oakhurst-grove to Tyrrell-road, for the Vestry of St. Giles, Camberwell. Mr. J. C. Reynolds, Surveyor :—

| | | | |
|---|---|---|---|
| Val de Travers Company | £268 | 5 | 0 |
| Limmer Asphalte Company | 186 | 0 | 0 |
| French Asphalte Company | 185 | 0 | 0 |
| Bradshaw & Co., 52, Queen Victoria-street, London, E.C. (accepted) | 181 | 18 | 4 |

LONDON.—For erecting shop and executing various repairs at No. 78, High-street, Camden-town, for Mr. Henry James. Mr. Robert J. Beale, architect, Westminster :—

Gould & Brand, Camden-town* .... £191 0 0

* Accepted.

LONDON.—For alterations and repairs at the "King John's Head," Southwark-street, for the Cannon Brewery Company, Clerkenwell, E.C. Mr. Jno. C. Reynolds, architect, 20, Camberwell-green, S.E. :—

| | | | |
|---|---|---|---|
| Tyerman | £1,097 | 0 | 0 |
| Cocks, Jno. & Hy. | 1,096 | 0 | 0 |
| Whitehead | 1,095 | 0 | 0 |
| Smith | 953 | 0 | 0 |
| Drew & Cadman (accepted) | 938 | 0 | 0 |
| Kenalway | 790 | 0 | 0 |

LONDON.—For alterations, &c., to the "Waterman's Arms," Nine Elms-lane, for the New London Brewery Co. Mr. E. R. Niblett, architect :—

| | | | |
|---|---|---|---|
| Gregory, Clapham Junction | £634 | 0 | 0 |
| Burman & Sons, Kennington | 610 | 0 | 0 |
| Dearing & Son, Islington | 610 | 0 | 0 |
| Spencer & Co., Lambeth (accepted) | 584 | 0 | 0 |

LONDON.—For alterations at the "Warwick Arms," Whitecross-street, E.C., for Mr. Hucks. Mr. E. R. Niblett, architect, Hackney, E. :—

| | | | |
|---|---|---|---|
| Burman & Son (accepted) | £175 | 0 | 0 |

LONDON.—For alterations and additions to refreshment-rooms in Battersea-park, for the London County Council. Mr. T. Blashill, architect :—

| | | | |
|---|---|---|---|
| Holloway Brothers | £380 | 0 | 0 |
| Lathey | 355 | 0 | 0 |
| Lapthorne | 277 | 0 | 0 |
| Hammond | 270 | 0 | 0 |
| McLachlan | 247 | 0 | 0 |
| A. & W. Garnar, Peckham | 220 | 0 | 0 |

LONDON.—For the erection of a billiard-room at Addison-road, Kensington, for Mr. F. Bailey. Mr. F. Le Rossignol, F.S.I., architect and surveyor, 1, Gresham-buildings, Basinghall-street, E.C. :—

| | | | |
|---|---|---|---|
| J. Langham (accepted) | £849 | 0 | 0 |

LONDON.—For alterations to and fitting up offices, Nos. 62 & 63, Mark-lane, for Messrs. Osborne, O'Donnell, & Osborne. Mr. F. Le Rossignol, architect and surveyor :—

| | | | |
|---|---|---|---|
| A. Walker (accepted) | £344 | 7 | 2 |

LONDON.—For two new shops at Bowyer-terrace, Clapham, for Mr. W. Gray. Mr. J. W. Stevens, architect :—

| | | | |
|---|---|---|---|
| Macey | £735 | 0 | 0 |
| Prestige & Co. | 627 | 0 | 0 |
| White | 620 | 0 | 0 |
| Peppiatt | 595 | 0 | 0 |
| Whitehead & Co. (accepted) | 595 | 0 | 0 |
| Creed | 583 | 0 | 0 |

LONDON.—For repairs and redecorations at Hanover Chapel, Rye-lane, Peckham. Mr. Thos. Thompson, surveyor, 388A, Old Kent Road, S.E. :—

| | | | |
|---|---|---|---|
| Young & Lonsdale | £204 | 0 | 0 |
| Welford | 200 | 0 | 0 |

LONDON.—For erecting new boundary wall and re-erecting van lodge, at the Anchor Brewery, Lewisham, for Messrs. H. & V. Nicholl, Limited. Mr. Albert L. Guy, architect, 78, High-street, Lewisham :—

| | | | |
|---|---|---|---|
| Kennard Bros. | £322 | 0 | 0 |
| S. J. Jerrard | 318 | 0 | 0 |
| Pritchard | 282 | 0 | 0 |
| Hoare | 258 | 0 | 0 |
| Robson, Lewisham (accepted) | 223 | 0 | 0 |

LONDON.—For shop fronts and fittings at 127, King's Cross-road, W.C., for Messrs. Allworthy Bros. :—

| | | | |
|---|---|---|---|
| S. Yardley & Sons (accepted) | £300 | 0 | 0 |

[Received too late for insertion last week.]

LONDON.—For show-cases and fittings to lobby and hall, for Mr. James Perriman, 160, High-street, Camden Town :—

| | | | |
|---|---|---|---|
| S. Yardley & Sons (accepted) | £145 | 0 | 0 |

[Received too late for insertion last week.]

LONDON.—For alterations to premises, new strong-room, shop front, and interior fittings, at 18, Porchester-road, Bayswater, for Mr. E. W. Thompson :—

| | | | |
|---|---|---|---|
| S. Yardley & Sons (accepted) | £485 | 0 | 0 |

[Received too late for insertion last week].

LONDON.—For show-cases, counters, and interior fittings for the Army and Navy Co-operative Stores, Limited, Westminster :—

| | | | |
|---|---|---|---|
| F. Sage & Co. | £892 | 0 | 0 |
| Drew & Cadman | 873 | 0 | 0 |
| S. Yardley & Sons (accepted) | 860 | 0 | 0 |

[This list was received too late for insertion last week.]

MILFORD HAVEN (S. Wales).—For pulling down and rebuilding the "Alma" Tavern, Milford Haven, for Mr. J. Vaughan. Messrs. Baldwin & Wood, architects, Milford Haven. Quantities by Mr. Henry Bushell, 1, Finsbury-circus, E.C. :—

| | | | |
|---|---|---|---|
| Simmons, Milford Haven | £1,008 | 4 | 6 |
| Cole, Milford Haven | 657 | 0 | 0 |
| William, Milford Haven | 645 | 0 | 0 |
| Phelps & Co., Milford Haven | 558 | 15 | 0 |

MITCHAM.—For alterations and additions to the "Gardeners' Arms," Mitcham, for Messrs. Truman, Hanbury, & Co. Mr. B. J. Capell, architect :—

| | | | |
|---|---|---|---|
| Hobbs | £286 | 0 | 0 |
| Whitehead & Co. | 265 | 0 | 0 |

ORPINGTON.—For the erection of the Village Hall at Orpington, Kent, for Mr. A. Brown. Mr. St. Pierre Harris, architect and surveyor, 1, Basinghall-street, E.C., and Orpington :—

| | | | |
|---|---|---|---|
| E. Lawrance & Sons, London | £3,795 | 0 | 0 |
| H. Somerford & Son, Clapham | 3,671 | 0 | 0 |
| D. Payne, Bromley | 3,329 | 0 | 0 |
| Holt & Son, Croydon (accepted) | 3,150 | 0 | 0 |

PLAISTOW (Kent).—For alterations to the "Prince Frederick" public-house, Plaistow, Kent, for Messrs. H. & V. Nicholl, Limited. Mr. Albert L. Guy, architect, 78, High-street, Lewisham :—

| | | | |
|---|---|---|---|
| C. Robson | £592 | 0 | 0 |
| Hoare | 500 | 0 | 0 |
| Pritchard | 493 | 0 | 0 |
| Kennard Bros. | 459 | 0 | 0 |
| Knight | 4[illegible] | 0 | 0 |
| D. Payne, Bromley (accepted) | 382 | 0 | 0 |

PLYMOUTH.—For rebuilding premises, No. 14, Cambridge-street, Plymouth, for Mr. J. C. Holland. Mr. Archd. D. Shortridge, architect :—

| | | | |
|---|---|---|---|
| Palmer | £555 | 0 | 0 |
| Debnam | 489 | 0 | 0 |
| Sweet | 484 | 10 | 0 |
| May | 459 | 0 | 0 |
| Lapthorne & Goad | 430 | 0 | 0 |
| Falk & Partridge | 422 | 0 | 0 |
| Shepperd (accepted) | 383 | 0 | 0 |

[All of Plymouth.]

PLYMOUTH.—For rebuilding premises, No. 35, Frankfort-street, Plymouth, for Mr. J. M. Sercombe. Mr. Archd. D Shortridge, architect :—

| | | | |
|---|---|---|---|
| Lapthorne & Goad | £469 | 0 | 0 |
| Falk & Partridge | 438 | 10 | 0 |
| Debnam | 429 | 0 | 0 |
| Pearn | 425 | 0 | 0 |
| May | 376 | 0 | 0 |
| Shepperd (accepted) | 357 | 0 | 0 |

[All of Plymouth.]

PLYMOUTH. — For additions to Mount Pleasant Temperance Hotel, Plymouth, for Mrs. Kernick. Mr. Archd. D. Shortridge, architect :—

| | | | |
|---|---|---|---|
| Lapthorne & Goad | £481 | 0 | 0 |
| Finch | 469 | 0 | 0 |
| Falk & Partridge | 463 | 10 | 0 |
| Debnam | 459 | 0 | 0 |
| May | 414 | 0 | 0 |

[All of Plymouth.]

POTTERS BAR (Herts).—For the enlargement of the Vicarage House, Northaw, Potters Bar, for the Rev. W. Bonsey. Messrs. Charles Kirk & Sons, architects, Sleaford. Quantities supplied by the architects :—

| | | | |
|---|---|---|---|
| Robert Williams, Barnet | £1,183 | 0 | 0 |
| T. & W. Savage, St. Albans | 1,055 | 0 | 0 |
| John Carnon, Barnet | 997 | 0 | 0 |
| Gabriel Warboys, Basingbourn | 938 | 0 | 0 |
| C. Miskin, St. Albans | 933 | 0 | 0 |
| Rudd & Son, Grantham (accepted) | 925 | 0 | 0 |

ST. LEONARDS-ON-SEA.—For the erection and completion of a private residence, Dane-road, for the Trustees of the Eversfield Estate. Mr. Frank H. Humphreys, architect, 6, Trinity-street, Hastings. Quantities by the architect :—

| | Estimate No. 1. | Estimate No. 2.* |
|---|---|---|
| Eldridge & Cruttenden | £5,498 | £283 |
| T. Salter | 5,320 | 190 |
| H. E. Cruttenden | 5,265 | 186 |
| C. Hughes | 5,225 | 214 |
| A. H. White (accepted) | 5,130 | 200 |

[All of St. Leonards-on-Sea.]

* Extra in fitting dining and billiard rooms in oak.

STREATHAM.—For alterations and additions to the "Horse and Groom," Streatham, for Mr. J. Pettingill. Mr. J. C. Reynolds, architect :—

| | | | |
|---|---|---|---|
| Cox | £450 | 0 | 0 |
| Drew & Cadman | 424 | 0 | 0 |
| Warne | 408 | 0 | 0 |
| Parker | 380 | 0 | 0 |
| Whitehead & Co. | 345 | 0 | 0 |
| Smith (withdrawn) | 317 | 0 | 0 |

WATFORD.—For erecting new stabling at Watford, Herts, for Messrs. R. White & Sons. Mr. C. W. Lovett, architect :—

| | | | |
|---|---|---|---|
| A & W. Garnar, Peckham | £560 | 0 | 0 |
| Judge, Watford | 548 | 0 | 0 |

WICKHAM (Kent).—For alterations and additions to the "Foresters' Arms," Wickham-lane, Wickham, Kent, for Messrs. Mitchell & Beasley. Mr. J. O. Cook, architect, Woolwich, S.E. No quantities supplied :—

| | | | |
|---|---|---|---|
| Battley | £591 | 0 | 0 |
| Foreman | 515 | 0 | 0 |
| J. O. Richardson, Peckham | 449 | 0 | 0 |

WOOD GREEN (Middlesex).—For erecting London Provincial Bank, Wood Green, N. Mr. A. R. Barker, architect. Quantities prepared by Messrs. Young & Brown, Henrietta-street, W.C. :—

| | | | |
|---|---|---|---|
| Lansdown | £3,632 | 0 | 0 |
| Yardley & Sons | 3,589 | 0 | 0 |
| L. & W. D. Patman | 3,440 | 0 | 0 |
| Messum | 3,279 | 0 | 0 |
| Shepherd | 3,195 | 0 | 0 |
| S. Jerrard | 3,080 | 0 | 0 |

[This list was received too late for insertion last week.]

*Alterations at the "Kenilworth Castle."*—The lowest tender in the list for this job, published in the *Builder* last week, p. 124, was sent by Messrs. G. Mower & Son, not by anyone named "Moore." The mistake was not ours.

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## TO CORRESPONDENTS.

W. H., "Studio" (we could not give any certain reply without seeing the structure. We may observe, however, that official surveyors generally understand their legal powers pretty well).—F. B.—"Quondam" (we believe that what you *intend* to say, as far as we can gather it, is true enough; but unfortunately your letter is too cloudy in diction to serve any good purpose in publication).—H. C. C. (next week).

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

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Advertisements for the current week's issue must reach the Office before THREE o'clock p.m. on THURSDAY, but those intended for the front Page should be in by the same hour on WEDNESDAY.

SPECIAL.—ALTERATIONS IN STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same must reach the Office before TEN o'clock on WEDNESDAY mornings.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c. left at the Office in reply to Advertisements, and strongly recommends that of the latter COPIES ONLY should be sent

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